American Cinematographer

A.S.C. MAGAZINE

December 1928
Vol IX No. 9
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Vol. IX December, 1928 No. 9

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The Voice of the A. S. C.

"TO HELL WITH PHOTOGRAPHY! WHAT ABOUT SOUND?"

In the October bulletin of the Academy of Motion Picture Arts and Sciences, mention is made of a discussion on "The matter of standardizing equipment and methods." During the discussion, Mr. Fred Pelton asked:

"Who is the King Pin in production, the cameraman or the director?"

"The one that talks loudest," replied Mr. Edmund Hansen, sound engineer with the Fox-Case organization.

This was generous of Mr. Hansen, for he might have said: "The sound engineer."

This brings up in a friendly way a matter that sooner or later must seriously occupy the attention of the production chiefs of the studios, for upon its proper settlement may depend the evolution of the pictures along the line of beauty, which essential element has been painstakingly built into production through many years of research, devotion to ideals and the expenditure of treasure in time and money so vast that it would build a fleet of battle cruisers for the United States navy.

The question is: Shall the beauty of the film be sacrificed to the exigencies of sound as they exist according to present-day sound picture technique? This technique, in so far as it affects the cinematographer's work, was outlined briefly in an article by Mr. Fred Westerberg, A.S.C., published in THE AMERICAN CINEMATOGRAPHER for November.

Mr. Westerberg does not attempt to go into all the phases of the subject, but upon the points he touches he makes his case conclusive.

Now as to beauty in films, which is absolutely dependent upon the cinematographic art, both the producers and the public will attest that it is, along with the entertainment value of the story, the sine qua non of motion picture production. If you don't believe this just recall the films of twenty years ago and ask yourself if you could endure this kind of art (or beauty) in your pictures of today.

The good, the true and the beautiful are still the three graces—the three ideals of art—and the last is not the least of this triad. Beauty, it may be said, is the enchantment of the picture and to permit anything to impair it would seem to be throwing away treasure beyond price.

Sound is in the pictures to stay. Beauty in cinematography is essential to the popularity of the films and upon them both depends the success of the cinema.

The motion picture industry has grown to its present importance by means of the silent picture embellished with the beauty placed in the film by the artistry of the cinematographer, and is this great artist to be treated like an intruder in his own house because zealots of the more mechanical department of sound technique assume a superiority which exists only in their own minds.

Cooperation! In that sign shall the sound pictures triumph and that means that both cinematographer and sound engineer shall be put and maintained in his proper place.

And this brings us to the heading of this paragraph. In a certain large Hollywood studio, a few days ago, the cinematographer in charge of the set was discussing the problems of getting better photography in the sound sequences, when the arbiter of sound gave voice to this expression. The cinematographer might have come right back with a reversal of this phrase, but he did not.

The A.S.C. magazine does not believe the producer feels that way about it and it is equally certain that the "cash customers" out in front of the screen are not going to share in such a sentiment.

TEN YEARS OLD

At 8 o'clock on the night of Saturday, December 21, 1918, at a meeting of cameramen held at the home of the late William C. Foster, in Hollywood, The American Society of Cinematographers was born, its motto being "Loyalty, Progress and Art."

For ten years this Society has persisted through many periods of storm and stress, some of which slowed up its progress, while others threatened to destroy it, but out of all difficulties it has arisen triumphant, the while strictly adhering to its ideals of loyalty, progress and art.

It had been hoped to celebrate this tenth anniversary in the midst of revelry and with all the trappings of victory and magnificence, but the unsettled conditions in the industry have counseled delay and the Board of Governors of the A.S.C. will defer the observance of this event until such time as it can be staged in a manner consonant with its importance.

In the meantime the A.S.C. starts upon the second decade of its history in the faith that it will not only continue as one of the essential units of the motion picture industry, but also that it will achieve new honors in research and pioneering in the field of cinematography.

OUT OF THE CHAOS

Out of this great chaos brought about by the advent of the sound pictures there will come order and it is likely to come more speedily than many people expect. The cameramen are rapidly equipping themselves for eventualities and the writers, for the first time in motion picture history, appear to be entering into their own. THE AMERICAN CINEMATOGRAPHER rejoices to see this as the writers certainly have not hoofed the rosy road. In regard to the new conditions, the Screen Writer's Bulletin says in part:

"And yet the mechanical problems presented constitute only a small part of the producers' troubles. The ramifications reach every branch of the industry and affect every worker in it. The actor, the director and writer must possess novel qualifications and develop a new technique or retire from the industry. The writer will be least affected, for his art has never been appreciated or even understood. Essentially the mechanics and the technique are separate problems. The mechanical is swiftly revolutionary; the artistic is deliberately evolutionary.

"The public demands novelty in its amusement and responds instantly to the blatant and bizarre, while the development of artistic appreciation is so slow as to be almost imperceptible. In the flurry and excitement over sound devices high priced dramatists and novelists, with little or no knowledge of picture-making, will be employed—with the usual results. As between high salaried dramatists and novelists who know little of pictures and experienced scenarists who know less of higher literary art, the producers will eventually choose the latter. Hollywood writers have nothing to fear."

A Night Before Christmas in Southern California—from the Camera of Mr. Fred Archer, A.S.C.

Sound Film Recording With the Light Valve

By Donald MacKenzie

Bell Telephone Laboratories, Inc.,
New York, N. Y.

The sound records I am about to describe are of the variable density type, and the method of making them is that developed by Bell Telephone Laboratories.

It is not difficult to specify the requirements of this type of sound film. So far as possible the exposure of the negative must be kept within the straight line portion of the Hurter and Driffield curve for the emulsion chosen, and the print must be timed with the same restriction. The development of the negative and of the print must result in a positive where the transmission of each element of length is proportional to the exposure of the corresponding element of the negative.

The light modulator must be supplied with undistorted power from the recording microphone and amplifier. When the positive is projected, the striations of the sound track must be enabled to modulate the illumination of a photo-sensitive cell to retranslate the photographic effect into electrical current which shall be fair copy of the microphone current generated by the original sound. From this point on the problem is the familiar one of sound re-enforcement, the film and cell having taken the places of the sound source and microphone.

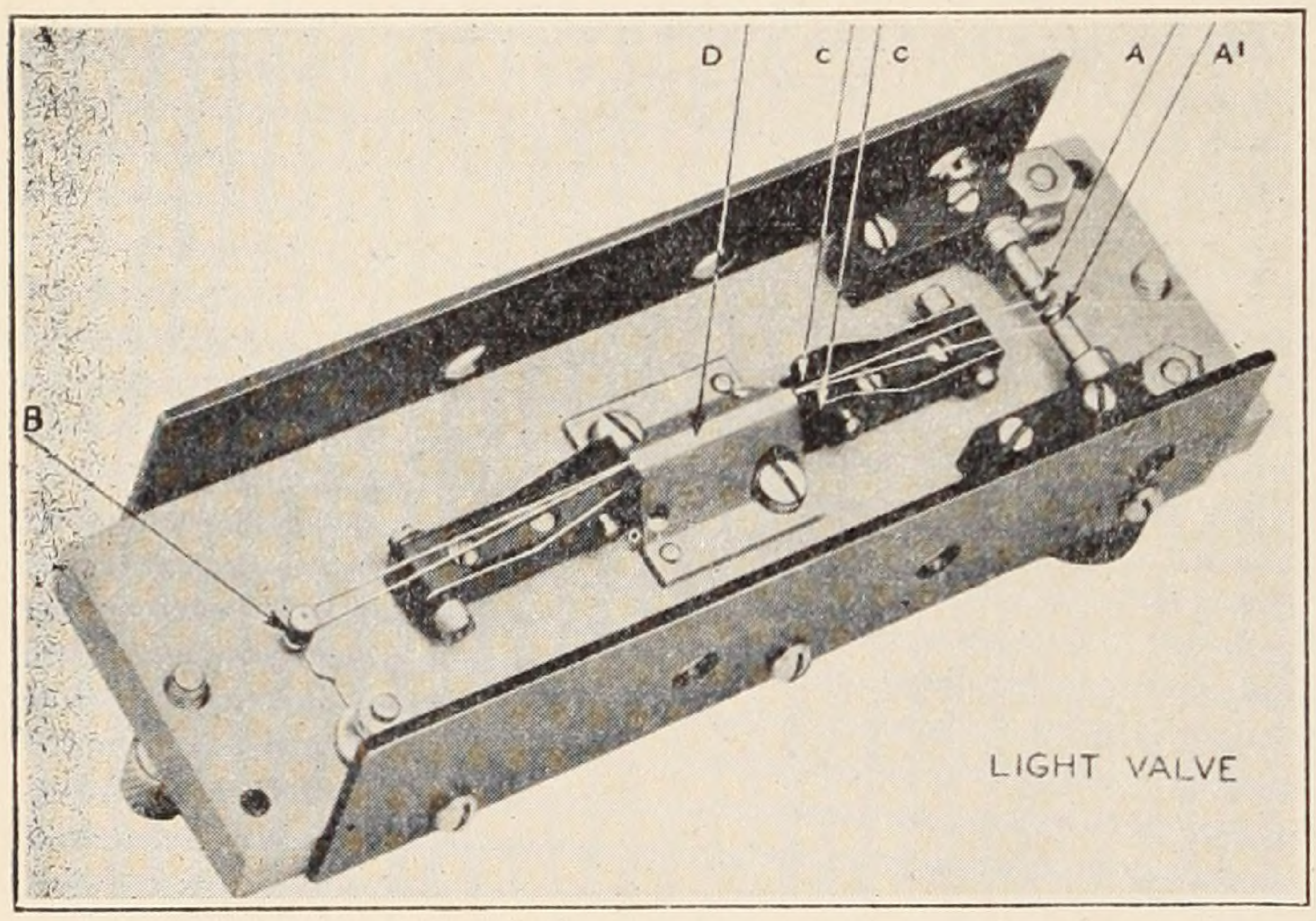

FIG. 1.

Figure 1 shows a photograph of the light valve, invented in 1922 by Dr. E. C. Wente of the Bell Telephone Laboratories. Essentially, it consists of a loop of duralumin tape suspended in a plane at right angles to a magnetic field. The tape, 6 mils wide and 0.3 mil thick, is secured to windlasses A and A^1 and stretched tight by the spring-held pulley B. At points C and C^1 insulated pincers confine the central portions of the tape between windlasses and pulley to form a slit 2 mils wide. Supporting this loop and adjusting devices is a slab of metal with central elevation D, which constitutes the armature of an electromagnet. The central portions of the loop are supported on insulating bridges to lie 3 mils above the face of D; here the sides of the loop are centered over a tapered slot, 8 mils wide by 256 mils long in this plane, opening to 204 mils by 256 mils at the outside face of the armature. Viewed against the light, the valve appears as a slit 2 mils by 256 mils.

The electromagnet core has a similar elevation opposing D across on air gap of 8 mils which closes to 7 mils when the magnet is energized from a 12-volt battery. A tapered slot in the magnet core begins 8 mils wide by 256 mils long and opens with the same taper as the slot in the armature. When the assembly of magnet and armature is complete, the valve constitutes a slit 2 mils by 256 mils, its sides lying in a plane at right angles to the lines of force and approximately centered in the air gap. The windlasses A and A^1, one of which is grounded, are connected to the output terminals of the recording amplifier. If the magnet is energized and the amplifier supplies a sine wave current from an oscillator, the duralumin loop opens and closes in accordance with the current alternations.

When one side of the wave opens the valve to 4 mils and the other side closes it completely, full modulation of the aperture is accomplished. The natural frequency of the valve is set by adjusting the tension applied by the pulley B; for reasons which involve many considerations the valve is tuned to 7000 cycles per second. Under these circumstances about 10 milliwatts of A.C. power are required for full modulation at a frequency remote from resonance; about one one-hundredth of this power at the resonant frequency. The impedance of the valve with protecting fuse is about 12 ohms.

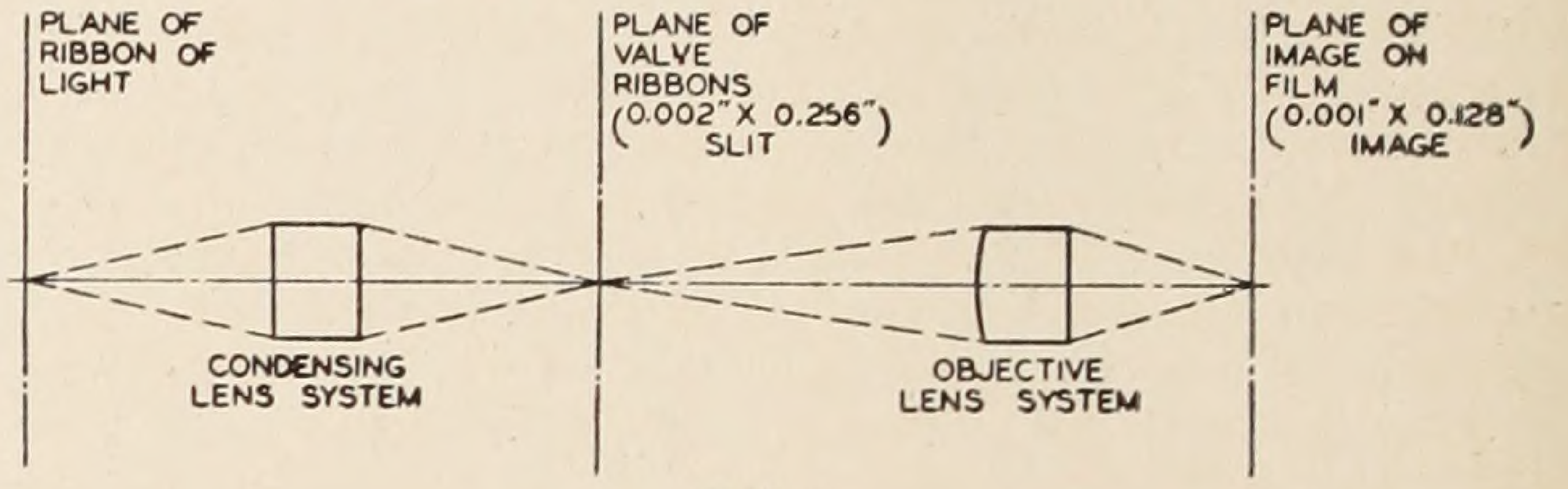
PLANE OF RIBBON OF LIGHT
PLANE OF VALVE RIBBONS (0.002" X 0.256") SLIT
PLANE OF IMAGE ON FILM (0.001" X 0.128") IMAGE
CONDENSING LENS SYSTEM
OBJECTIVE LENS SYSTEM

FIG. 2.

If this appliance is interposed between a light source and a photographic film we have a camera shutter of unconventional design. Figure 2 shows a diagram of the optical system for studio recording. At the left is a light source, a ribbon filament 18 ampere projection lamp, which is focussed on the plane of the valve. The light passed by the valve is then focussed with a 2 to 1 reduction on the photographic film at the right. A simple achromat is used to form the image of the filament at the valve plane, but a more complicated lens, designed to exacting specifications by Bausch and Lomb, is required for focussing the valve on the film. The undisturbed valve opening appears on the film as a line 1 mil by 128 mils, its length at right angles to the direction of film travel. The width of this line varies with the sound currents supplied to the valve, so that the film receives a varying exposure: light of fixed specific intensity through a varying slit.

Figure 3 shows a studio recording machine with the door of the exposure chamber open. In this machine the film travels at 90 feet per minute, and the sound track is made at the edge away from the observer. The line of light, the image of the valve, overruns the perforations by 6 mils, extending toward the center of the film 122 mils inside the perforation line. The right-hand sprocket serves to draw film from the feed magazine above and to feed it to the take-up magazine below; this sprocket is driven from the motor shaft through a worm and worm wheel. The left-hand sprocket engages 20 perforations and is driven through a mechanical filter from a worm and worm wheel similar to that driving the feed sprocket. The mechanical filter enforces uniform angular velocity of the left-hand sprocket which carries the film past the line of exposure; the focussed image of the valve; balancing of the flywheel which forms part of this mechan-

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This article was originally presented at the Fall convention of the Society of Motion Picture Engineers held at Lake Placid, N. Y., September 24-28, 1928.

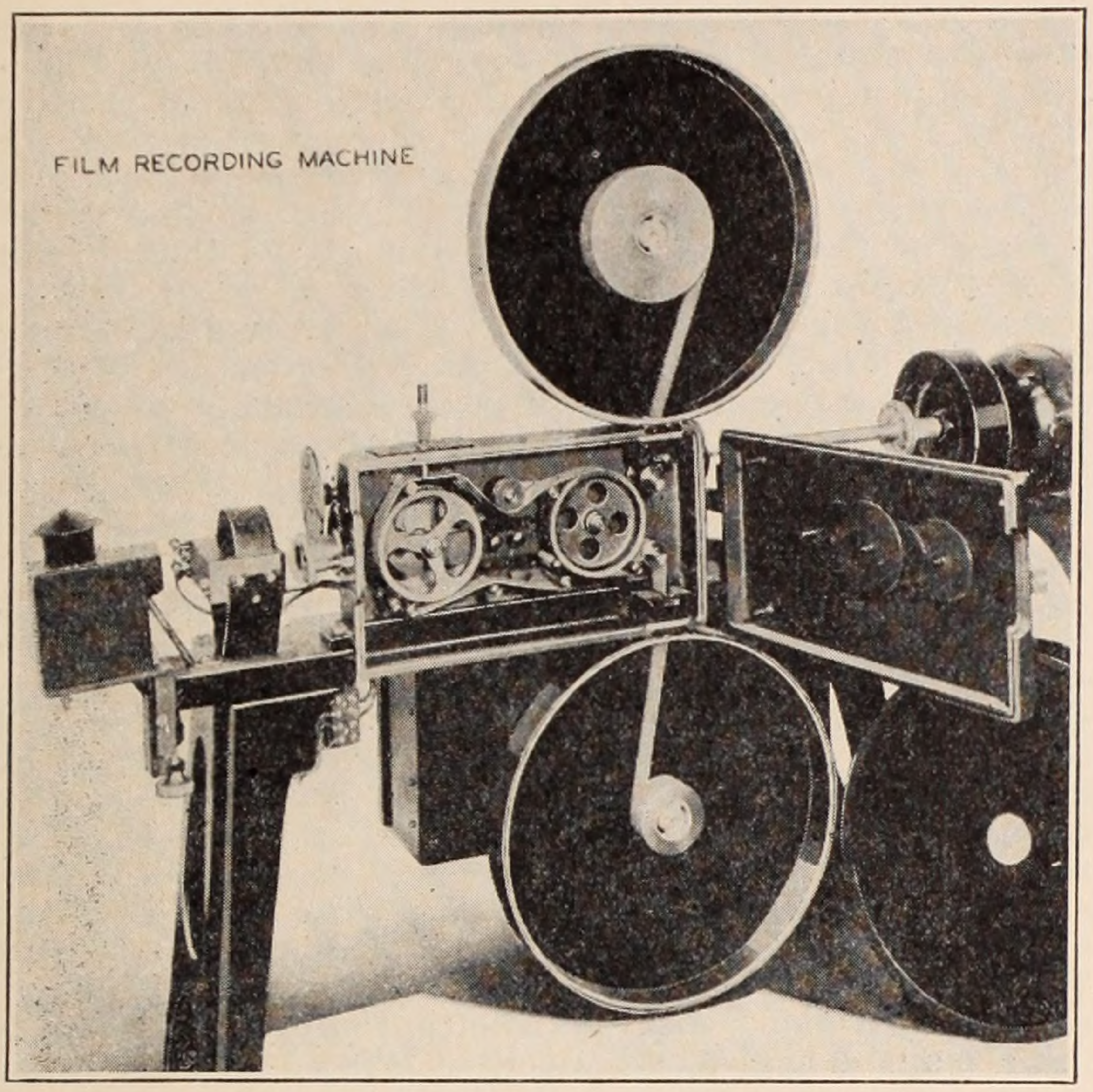


FIG. 3.

ical filter holds the angular velocity constant to one-tenth of one per cent, despite the imperfections of the driving gears.

So far we have provided a means for driving the film and a means for modulating the light thereon, but we have not chosen the average illumination about which the modulation is to take place. The maximum exposure corresponds to the maximum opening of the valve and is therefore double the average. Choose now the contrast to which the negative sound record is to be developed and draw the Hurter and Driffield curve for this contrast for the emulsion chosen for the negative sound record. The maximum exposure should correspond to the beginning of over-exposure, the average should be half this. The Hurter and Driffield curve will give the density of the over-exposure point for the chosen contrast and the density for half this exposure. Let the machine run to expose film to light through the unmodulated valve for several values of the lamp current. Develop the film and measure the densities due to the various values of lamp current. Select, by interpolation if necessary, the lamp current which corresponds to half over-exposure. With this current in the lamp the machine is ready to make a sound record, since the focussing of the valve has already been done and manufacturing specifications insure that the line of illumination shall lie, within 3 minutes of arc, at right angles to the direction of film travel.

Consider at this point the procedure in the recording studio. Adding sound to the picture introduces no complication of technique other than to require sufficient rehearsing to make sure of satisfactory pick-up of the sound: microphone placement must be established and amplifiers adjusted to feed the light valve currents which just drive it to the edge of overload in the fortissimo passages of music or the loudest utterances of speakers.

In Figure 3 the photograph shows a photo-electric cell mounted inside the left-hand sprocket, which carries the film past the line of exposure. Fresh film transmits some 4 per cent of the light falling on it, and modulation of this light during the record is appreciated by the cell inside the sprocket. This cell is connected to a preliminary amplifier mounted below the exposure chamber, and with suitable further amplification the operator may hear from the loud speaker the record as it is actually being shot on the film. Full modulation of the valve implies complete closing of the slit by one side of the wave of current; this modulation should not be exceeded or photographic overload will abound.

One or more cameras and one or more sound recording machines are driven by motors electrically synchronized from a common distributor. Speed control and synchronization of these motors are described in Mr. Stoller's paper. At the beginning of the day's work a check is made of the operation of the driving motors, and the tuning and spacing of the valves is verified.

Figure 4 is a schematic diagram of the studio equipment for sound recording. Provision is made for combining, if desired, the contributions of several microphones on the set. This combination is under the control of the mixer operator in the monitoring room, viewing the set through a double window in the studio wall. The mixer controls also the gain of the amplifiers for the recording machines.

The diagram shows relays which permit the mixer to connect the horn circuit either directly to the recording amplifier or to one or the other of the monitoring photo-electric cells in the film recorders. The direct connection is used in preparing the sound pick-up in the studio: the program is rehearsed until satisfactory arrangement of microphones and of amplifier gain is effected. The electrical characteristic of this direct monitoring circuit is so designed that the sound quality heard in the horns shall be the same as the quality to be expected in the reproduction of the positive print in the theater. Acoustic treatment of the walls of the monitoring room secures the reberberation characteristic of the theatre, and the monitoring level is so adjusted that the mixer operater hears the same loudness that he would wish to hear from the theater horns. It is capitally important that the operator judge his pick-up on the basis of sound closely identical in loudness and quality with that to be heard later in theatre reproduction.

After the pick-up has been established on the direct monitoring circuit, the output of the recording amplifier is applied to the light valves and the monitoring horns are connected to the photo-cell amplifiers on the recording machines. With no film in the machine and at a convenient lamp current a complete rehearsal is made to verify the operation of the valves at the proper level. Film is then loaded, cameras and sound recorders are interlocked and starting marks made on all films by punches or light flashes.

A light signal from the recording room warns the studio, which after lighting up signals back its readiness to start. The machine operator starts the cameras and sound recorders, brings up the lamp current to the proper value, and when the machines are up to speed, signals the studio to start. During the recording the mixer operator monitors the record through the light valves, thereby assuring himself that no record is lost.

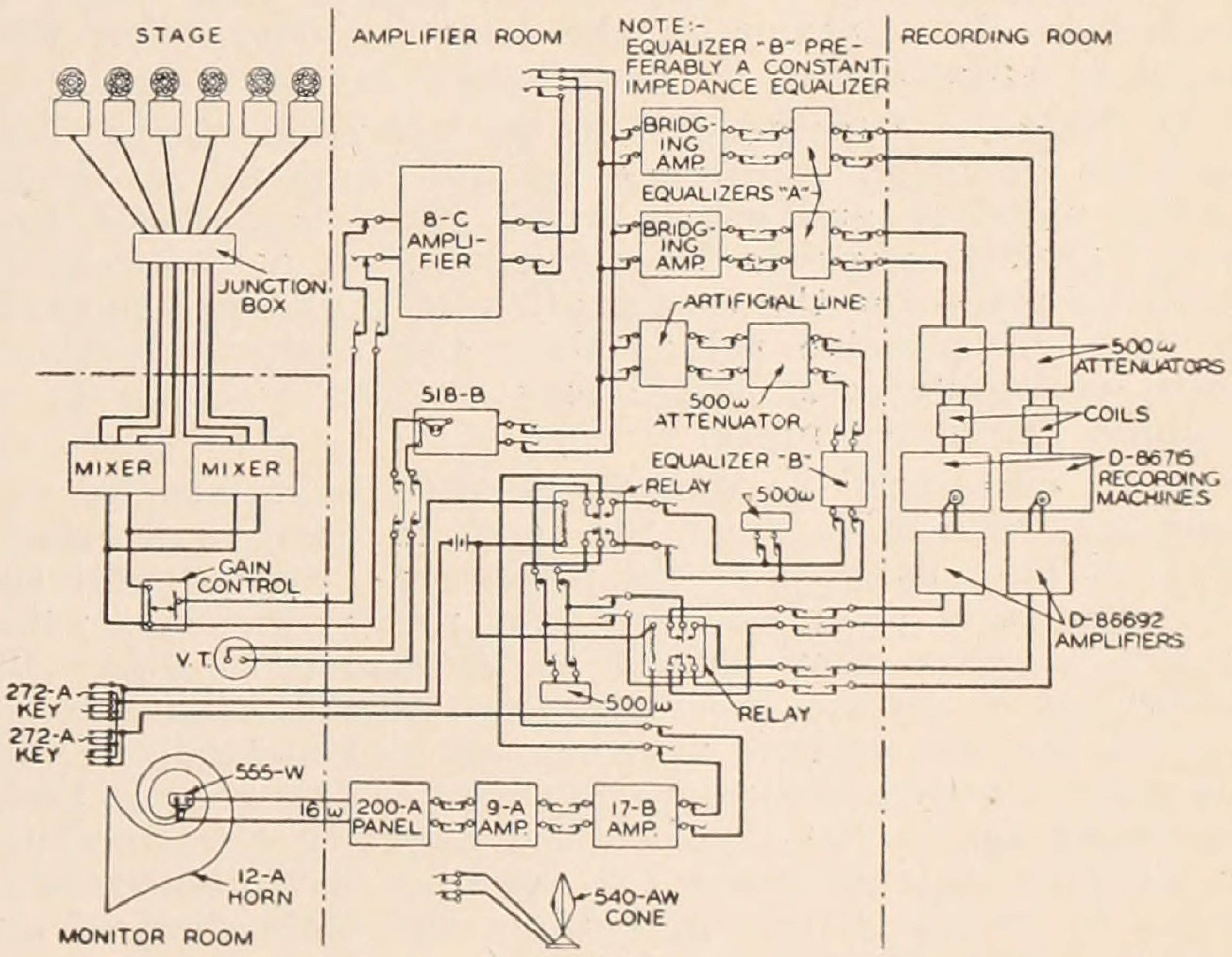


FIG. 4.

In the choice of emulsion for the sound negative, the usual designation of speed may be disregarded, because it is desired to make the exposure of the unmodulated track many times the under-exposure of the emulsion used. The advantages of positive emulsion for the sound negative have come to be generally recognized; positive has been used by Bell Telephone Laboratories since 1924. The scale of Eastman positive film is about 20 to 1; we adjust the recording lamp current to give an illumination on the film for the unmodulated track of 10 times the under-exposure. After one lamp has been calibrated as described before, it may be replaced when necessary by another in which the wattage in the ribbon filament is the same; the light emission is very closely correlated with the wattage. Where the unmodulated or average exposure is ten times the under-exposure minimum, 90% modulation of the light can be permitted without running into under-exposure on the faint side of the wave. For sound currents reaching 100% modulation of the light, 90% of the wave is free from distortion; if the average light were halved, still 80% would be free from distortion. There is, therefore, considerable latitude in the average exposure, and the negative is satisfactory if the transmission of the unmodulated track lies between fairly wide limits.

The choice of the negative sound gamma is determined by the practice of the laboratory in regard to picture development. It is usual to see on the screen pictures whose overall gamma considerably exceeds unity. On the sound track the overall gamma should equal unity, and the development of sound negatives should be uniform, though that of picture negatives is left to the judgment of the finisher.

Theoretically, it should be immaterial what combination of reciprocal values is chosen for the negative and positive sound gammas. Practically, we have to recognize the existence of ground noise in all records and take precaution to minimize it. No matter how excellently we reproduce the fortissimo passages, our record is unsatisfactory unless the ground noise is low enough for a wide volume range, that is, a wide range in level between fortissimo and pianissimo. Whether our negative sound record is made on negative or positive emulsion, there is always the danger that in reproduction we shall encounter variations in transmission from point to point due to local variations in the celluloid base, to local action of the developing agent, or to a developer excessively granular in action. The photo-electric cell is able to recognize variations of 1/10 of 1 per cent, whereas the eye ignores contrasts under 2 per cent. These local variations in transmission, continued to the positive print, constitute the ground noise.

The remedy is, in part, to chose a developer which produces a minimum graininess. In part, to insist on machine development of the sound film with thoroughly agitated developer. Further, to carry the sound development to a high gamma; this obviates, to a large extent, flow marks of the developer, and goes a long way to escape local variations in the base by developing the negative striations to be conspicuous in comparison.

In 1924 we concluded that the optimum choice was positive emulsion developed to unit gamma for both sound negative and sound print. This is feasible for sound records separate from pictures, but a compromise must be made for the combination of sound and picture in a single positive print. Here the positive development required for a satisfactory picture is always to a gamma far above unity.

It is customary to develop picture negatives by inspection, having in mind the uniform positive development to be undergone by the prints from these negatives. The gamma of these positives need never exceed 1.8; the sound negative then should be developed to 0.55. In order not to disturb the practice of the film laboratory, we ask that the positive development be standardized and its gamma ascertained, the reciprocal of this gamma then arranged for in the standardized negative development. A negative gamma above 0.5, together with the precautions of careful handling, permits the realization of an adequate volume range.

It is beyond the scope of this paper to discuss the details of manipulation and of choice of developer, but I wish to acknowledge the cooperation of Mr. J. W. Coffman in the solution of such problems. The problem is the reduction of ground noise, and its seriousness is not to be diminished by choosing a different recording method.

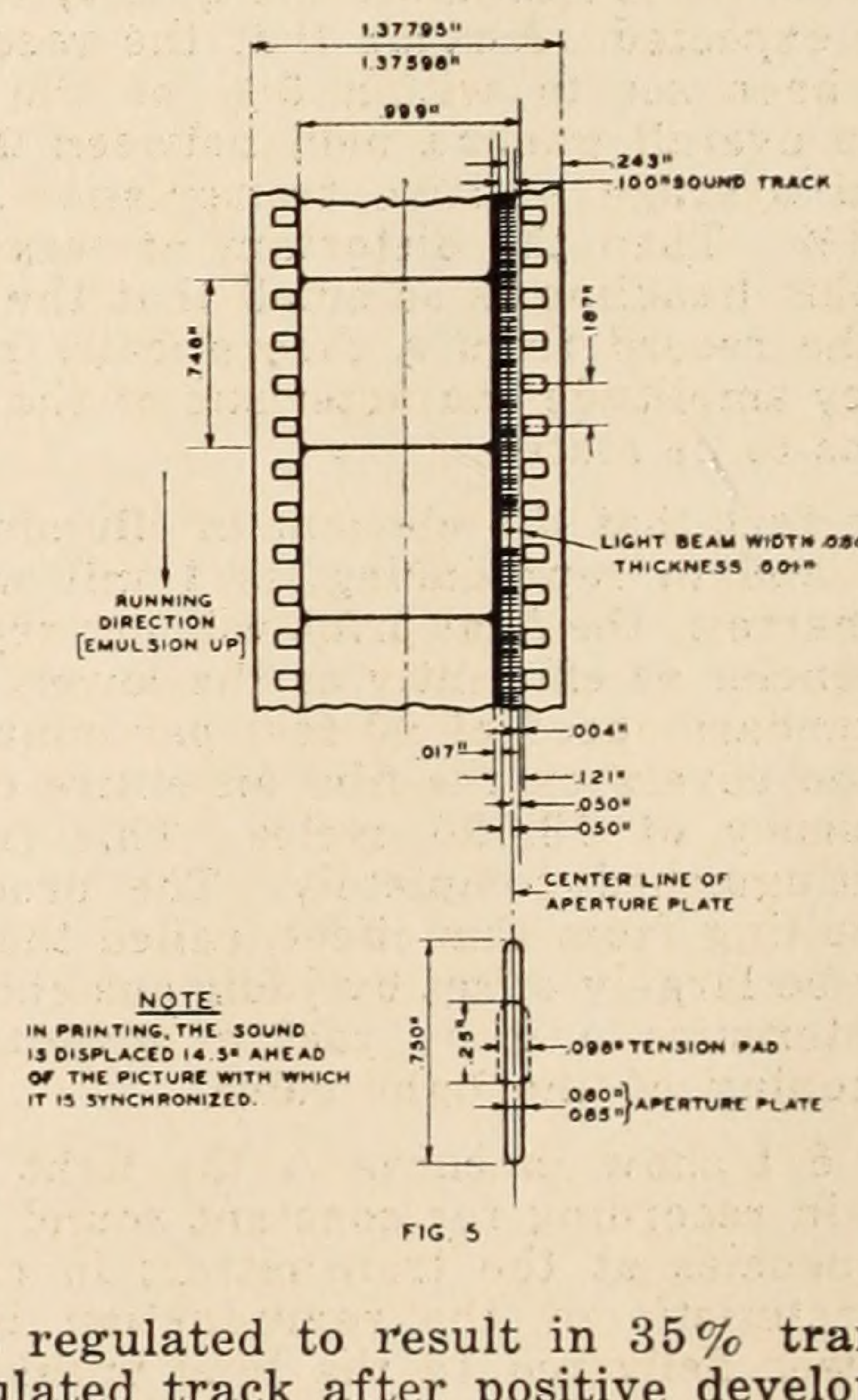
In printing the sound negative, a uniform density for the print of the unmodulated track is desired. The volume of reproduced sound for a given reproducing light source, varies directly with the average transmission and the per cent modulation of this average. This average density should be on the straight line portion of the positive Hurter and Driffield curve, far enough to keep the denser negative portions from reaching the under-exposure region. For Eastman positive film a suitable transmission of the unmodulated portion of the sound print is 35%, referred to air, for the usual values of positive gamma: 1.4 to 1.8. At this average transmission only the peaks of the recorded sound will encroach on the region of under-exposure. For the reciprocally developed negative track the region of under-exposure will have been reached by occasional peaks on the other side of the wave, and such photographic distortion as exists will be balanced between positive and negative.

Here we appropriately consider the photographic distortion as it occurs in variable density records. If the entire negative exposure has been confined to the under-exposure region of the emulsion chosen, a huskiness will result in the reproduction which cannot be corrected by any known technique. But if the unmodulated negative transmission, for a gamma of 0.55, is about 16% referred to air, 90% of the wave will be clear of under-exposure, and experience shows that the ear detects no distortion. In telephonic terms, everything at a level 1 TU below full modulation will be free from distortion, and the peaks will be substantially perfect. The same may be said of the positive printed to an average transmission of 35%, provided the overall gamma approximates unity.

It has been calculated that if the overall gamma departs from unity by 0.2 in either direction, a harmonic of 5% amplitude of the fundamental will be introduced. Experimentation has shown that a 5% harmonic is the least detectible. We state then the tolerance on the overall gamma for the sound track as 0.8 to 1.2. Variation of corresponding amount in the contrast of a picture print is intolerable; therefore greater latitude in contrast is permissible in the sound record than could be tolerated in the accompanying picture.

In printing these sound negatives in combination with pictures for projection in the theatre, it is customary at the present time to print one negative, masking the space needed for the other, then run the positive again through the printer with the other negative, masking now the space already printed. In printing the picture negative, light changes are made as usual; for the sound negative the light is regulated to result in 35% transmission of the unmodulated track after positive development. Provision of suitable masks in the camera has been made to show in the finder and expose on the film only the portion which will be available for picture projection.

PICTURE AND SOUND TRACK DIMENSIONS OF SYNCHRONIZED SOUND FILM FOR STANDARD 35MM POSITIVE STOCK


1.37795"
1.37598"
.999"
.243"
.100" SOUND TRACK
.746"
.187"
LIGHT BEAM WIDTH .080" THICKNESS .001"
RUNNING DIRECTION [EMULSION UP]
.004"
.017"
.121"
.050"
.050"
CENTER LINE OF APERTURE PLATE
.750"
.25"
.098" TENSION PAD
.080" .085" APERTURE PLATE

NOTE: IN PRINTING, THE SOUND IS DISPLACED 14.5" AHEAD OF THE PICTURE WITH WHICH IT IS SYNCHRONIZED.

FIG. 5

In the theatre projector, the sound gate is located 14.5

inches below the picture gate, in order to project the sound record at a point where the film is in continuous motion. Therefore, in the printing, it is arranged to print the sound negative displaced along the length of the positive enough to bring the sound 14.5 inches ahead of the corresponding frame. The printer apertures are chosen to give a dark no man's land 17 mils wide between picture and sound track; the latter at the outside is separated 4 mils from the inner perforation edge.

Figure 5 exhibits the present practice for the finished positive. It will be seen that the sound track covers 100 mils clear, and is illuminated in the projector by a line of light 80 mils long, 1 mil wide, centered on the striations. This gives a margin of 10 mils at each end of the reproducing line, an allowance for lateral shifting of the film on the sprocket teeth.

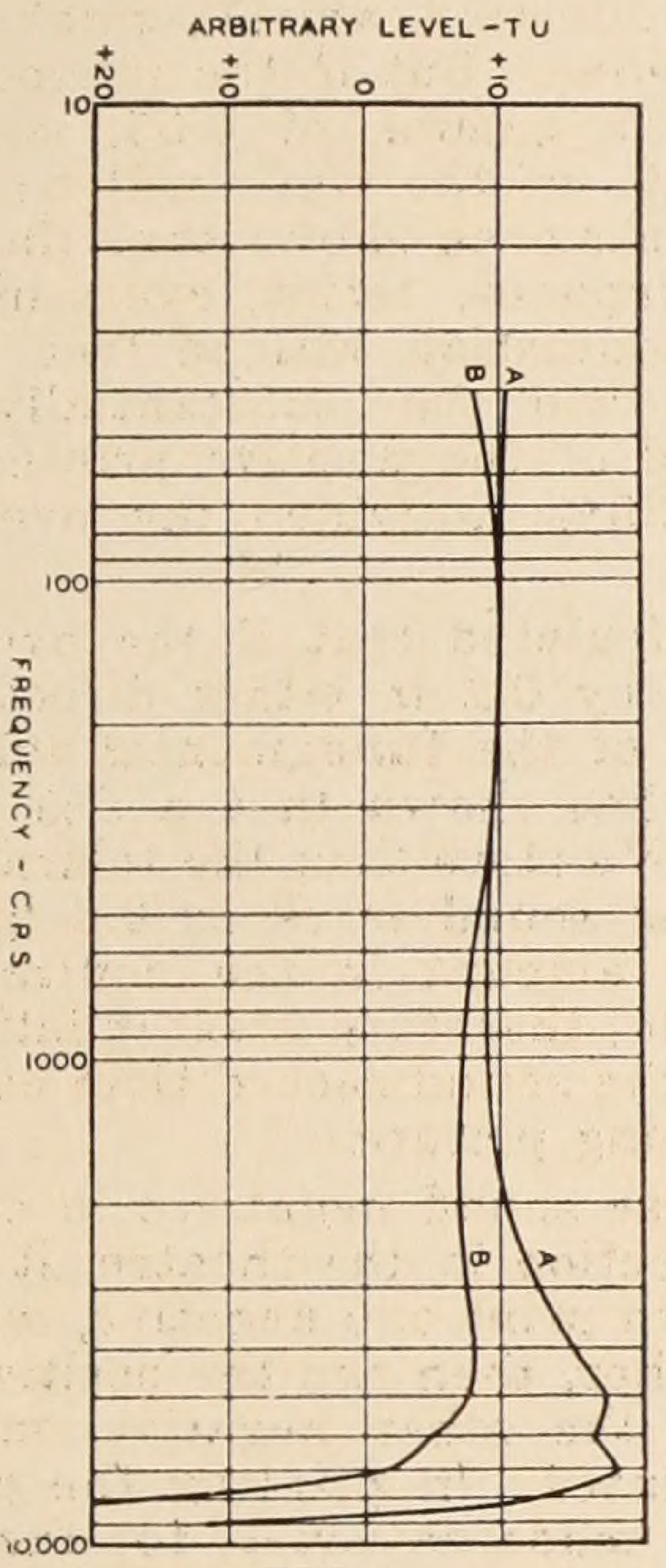


FIG. 6.

In conclusion, let me estimate the quality of the sound record to be expected. Assume that the recording lamp current has been set to within 5% of the theoretical optimum, the overall gamma held between 0.8 and 1.2, and the final average positive transmission is between 32% and 38%. Then the distortion of wave form due to photographic handling is so small that the ear cannot distinguish the record from a theoretically perfect one. The frequency-amplitude characteristic of the reproduced sound remains to be stated.

Due to the fact that the element of illumination, both in recording and in reproducing, is 1 mil wide instead of infinitely narrow, the final print will not reproduce the higher frequencies as efficiently as the lower. For example, at the standard speed of 90 feet per minute, the line of illumination covers on the film an entire cycle length of the frequency of 18,000 cycles. This frequency is therefore extinguished completely. The drooping characteristic resulting from this effect, called the film transfer loss, may be largely offset by judicious choice of electrical characteristics and by taking advantage of the mechanical tuning of the light valve.

In Figure 6 I show in curve A the light modulation by the valve in recording for constant sound pressure of various frequencies at the transmitter; in curve B the overall characteristic of the reproduction in terms of electrical power delivered to the loud speaker for constant sound pressure at the transmitter in the studio.

The difference of curves A and B is the uncompensated part of the film transfer loss. Experience shows that curve B is close enough to flat; the success of the recorl, as of the picture, depends on the director.

Motion Picture Studios In France

Name	Address	Phone
Albatros Studio—	52, rue du Sergent-Bobillot Montreuil-sous-Bois (Seine)	Inter-Montreuil 0:57, 2:70
Studio de Billancourt—	49, Quai du Point-du-Jour Billancourt (Societe Generale de Films)	Auteuil 50:12
Studios des Cineromans—	20, Avenue du General-Gallieni Joinville-le-Pont (Seine)	27:46 Diderot 48:69
Eclair Studios—	10, rue du Mont Epinay-sur-Seine (S. & O.)	Nord 59:99 61:93
Film d'Art— Vandal & Delac—	14, rue Chauveau Neuilly-sur-Seine (Seine) Paris Offices: 11 Boulevard des Italiens	Wagram 94:06 74.54 Louvre 08:46 08:25
Gaumont Studios— Paul Martel, Director.	53, rue de la Villette Paris (XIX)	Combat 09:33
Gaumont Studio— Gabriel Mareschal.	42, Avenue Saint-Augustin Nice (A. & M.)	50:26 Nice
Studio de Joinville—	7, rue des Reservoirs Joinville	Diderot 42:40
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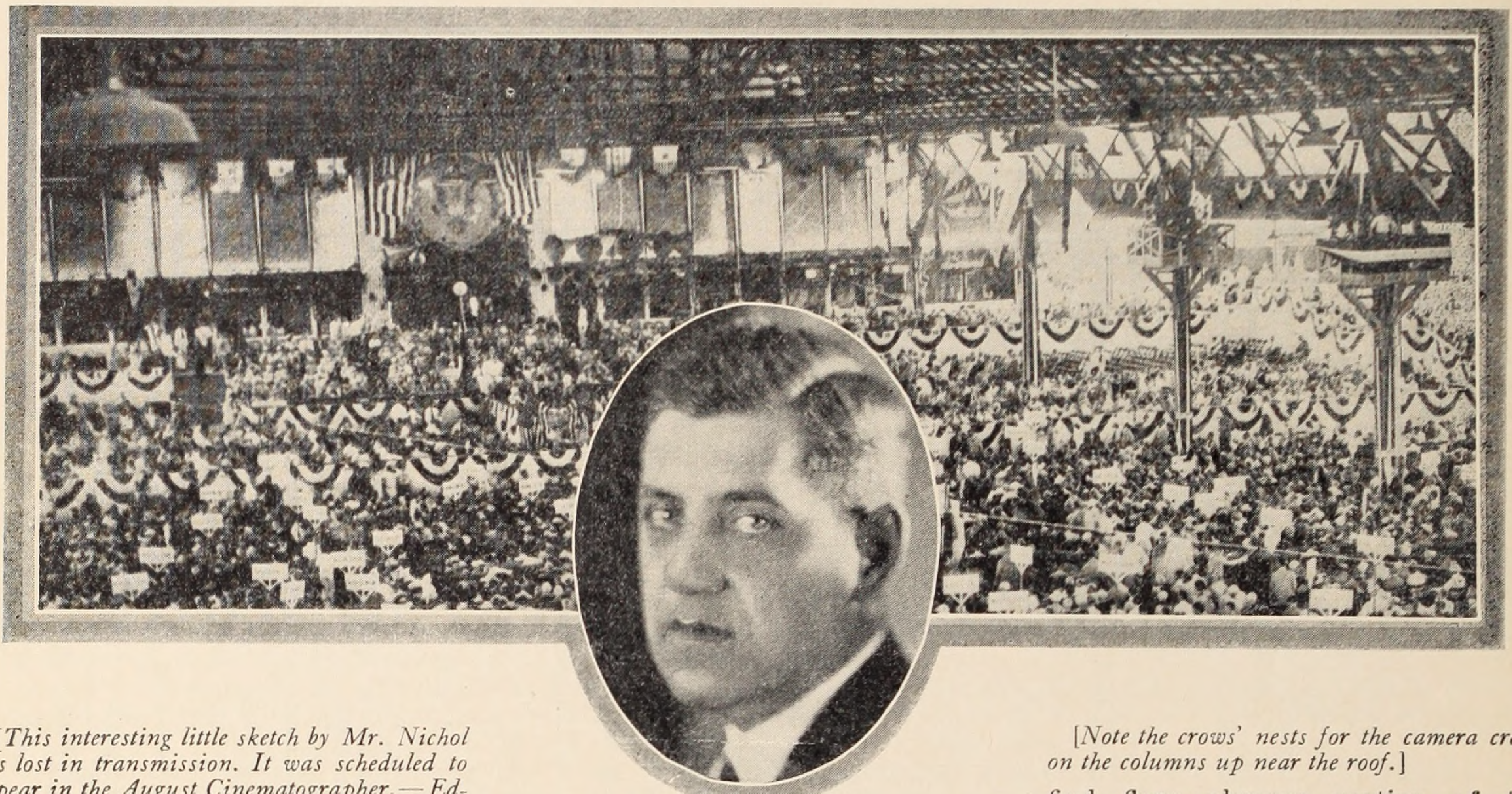
Rex Ingram Cine Studios— Harry Lachmann.	St. Augustin Nice (A. & M.)	50:08 Nice
Roudes Studios—	3 bis & 5, Boulevard Victor-Hugo Neuilly-sur-Seine	Wagram 94:21
Studios Reunis (Natan)—	6, rue Francoeur Paris (XVIII)	Marcadet 17:27 18:17

List of German Studios

Name	Address
Emelka Studio	Geiselgasteig bei Hunich
Europaische Film-Allianz	Cicerostrasse 2/6, Halensee-Berlin
Filmwerke Staaken	Staaken bei Berlin
Glashaus-Film	Borussiastrasse 45/49, Berlin-Templehof
Grunewald-Film Studio	Am Konisweg 148, Berlin-Grunewald
IFA Studio	Schonholz-Reinickendorf
Johannisthaler Filmanstalten	Berlin-Johannisthal, Flugplatz
Mayfilm A.-G.	Berlin-Weissensee, Franz-Josef-Strasse 5/7
Maxim Film Association	Ebner & Co., Berlin S.W. 29, Blucherstrasse 32
Muto-Gross Studio	Berlin-Lankwiz, Zeintenstrasse 10
Phoebus-Film A-G.	Berlin S 59 Hasenheide 21
Rex Film A-G.	Berlin N 39, Mullerstrasse 182/183 Berlin-Marienfelde
Terra-Glashaus Studio	William-von-Seimens-Strasse 46/47
Universum-Film A-G.	Betrieb Neubabelsberg, Neubabelsberg bei Berlin
Universum-Film A-G.	Betrieb Tempelhof, Oberlandstr. 27/34

Filming A National Political Convention



[Note the crows' nests for the camera crews on the columns up near the roof.]

[This interesting little sketch by Mr. Nichol was lost in transmission. It was scheduled to appear in the August Cinematographer.—Editors Note]

By Raleigh B. Nichol
Western Editor, Pathe News, Los Angeles, Calif.

Just received a wire with a Muncie, Ind., date line from the boss, assigning me to assist in covering the Democratic National Convention at Houston, Texas, on June 25th. Wonder what he is doing in Muncie? Understand he has a farm in the Hoosier state and probably wants to know what the crop outlook is.

We clamber aboard the "Sunset" on the morning of the 23rd and arrive in Houston early the second morning. Hear bands playing as we pull in, but for arriving delegations—not yours truly. No one there to meet me. Don't know where the Pathe News headquarters is. There are some still men shooting arriving delegates—maybe they know; yes, the Auditorium Hotel. Bellhop grabs the Akeley and my bags and ushers me into the lobby. Boss has room reserved and everything ready. Rooms practically all taken by photographers and newspapermen. Guess they are all in the lobby when I arrive. Some I remember when I worked in the East years ago. Glad to see the boss again.

Everything pretty well set for the opening session on the morrow. We have our own laboratory here, moved a portable plant down from Chicago. Film laboratories in places such as Houston are not so good—cannot give speed or service. Maintained merely for local theatre trailers, etc. Boss has rented a house, installed telephone, telegraph, a radio and all modern film conveniences. Most compact plant I ever saw. Can all be packed in four large trunks. We go over to the convention hall to get the lay-out. About half way up the supporting columns are platforms which resemble crows nests on a ship. This is where the cameramen will be. Must climb ladders and haul the cameras up with ropes. The lights are being installed, six sun arcs on the floor and two spots in the crows nests. Understand the light men have their first check from the party, so they are rarin' to go!

Up early the next morning and ready for the big show. I am assigned to pillar No. 3 on the left with a competitive newsreel man and a still man. Haul cameras up and find flags obscure portion of the view. Get men from the firse station next door and with long poles they get flags out of the way. In so doing knock over still man's big bertha which has a 25-inch lens. Only damage is to still man's disposition. One of our boys from New York is sore because he has to work in the same crow's nest with Movietone. Claims they take up all the room. His fears, though, were for naught when he learned that Movietone is not working on the opening session inside the hall. Our crew consists of the boss and two camera men from New York, our own political man from Washington, three men from Chicago, five other men from the state of Texas and the writer, from Los Angeles. Our political man is on the speaker's platform and works the bell for the lights. The hall is rapidly filling with delegates and visitors. The Governor of Texas arrives bearing the flag of his state and receives tremendous ovation. The temporary chairman mounts the platform with gavel in hand. "Mac" pushes the button, one of the lights flashes up and the others follow suit. The chairman pounds with his gavel and calls the convention to order. Slides are pulled, shutters click and cranks are turned. But the convention does not seem to want to come to order. Those on the floor are all talking and milling around. So the chairman must continue to pound. Glad he is pounding as we need the additional footage. Finally they come to order and we get the shots we want of the delegates and visitors, numbering about 25,000.

A beautiful creature in pink sings "The Star Spangled Banner" and a local minister reads the invocation. Someone makes a motion to adjourn. The motion is carried and we are to meet again at 7:30 that night. We clamber down from the crow's nest with magazines in hand and run around the corner to the lab. One of the other cameramen is already there with his stuff. Said he found an unused door. Everything is ready in our house-laboratory. The titles were made up in advance and the boys were on their toes ready to go. The developer takes our film and starts putting it through. The third man comes in with his and that is also soon in the soup. About two-thirds of the first release is already made up. Which consists of close-ups of those prominent in the party, arrival of delegates, etc. Ah! The negative is coming off the drum—the boss goes into the cutting run and selects the scenes he wants. The titles are dropped in and splices made.

Now the timing is done and the printers start to work. The first session was over at 12 o'clock and at 3:30 we are on our way to the postoffice and express office with the back of our car filled with prints. In addition to this, had negatives to ship to New York, Chicago, Pacific Coast and other important centers where our laboratories printed for their particular localities. The air mail left at 4 o'clock and we learned years ago that your Uncle Sam does not hold his mail planes for newsreels or anyone else, so we had to step on it.

Back at the convention hall for the evening session. The boss has assigned me to cover the floor of the convention hall tonight. So up in the crow's nest to get the outfit. One of my competitors helps me down with it. The hall is being filled quickly and we are looking for a good location. Difficult to find a suitable spot. Can't set up in front of people. Would mean a bawling out and a possibility of being thrown out by some one of the many assistant sergeants-at-arms. Finally select what seems to be a good place alongside one of the lights. Stand on box with tripod legs fully extended to shoot over the heads of the crowd. A speaker mentions a prominent candidate. The crowd goes wild and stands up on the chairs which absolutely blocks my view. And that means that this location is the bunk. See some empty seats in one of the band stands. No, can't set up there—these seats are for late-arriving bandmen.

At last find room in rear of press box. Set up and get some good close-ups of keynote speaker, using 12-inch lens—also more crowd stuff. Keynoter mentions name of candidate who later receives nomination. Wild demonstration begins. Delegates grab flags and banners and start parade around the hall. Dignity is cast aside. Seemingly everyone is yelling as hard as possible, and waving flags and banners. All of this lasts about twenty minutes, despite efforts of the chair to maintain order. It sure made good film.

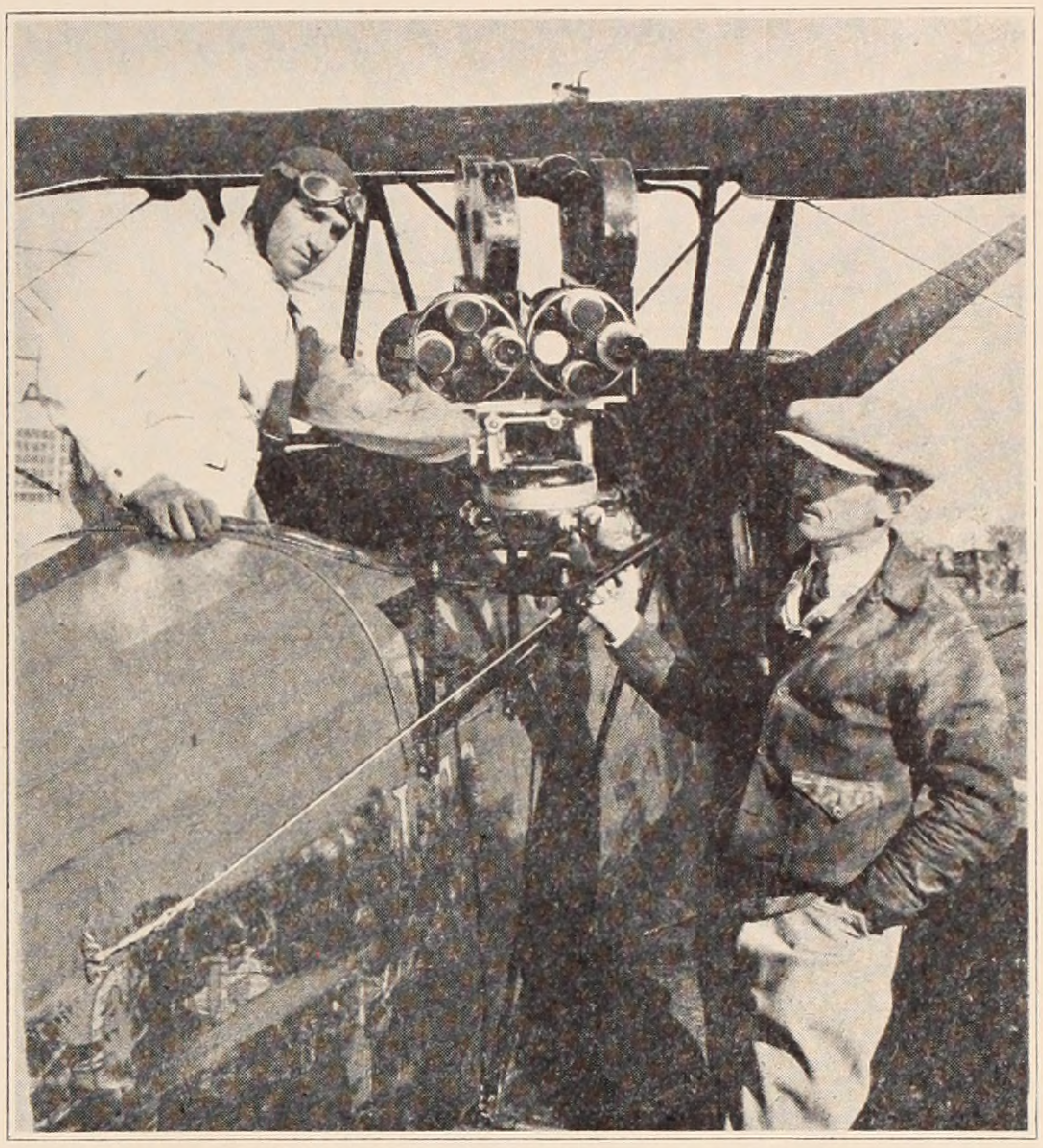
Convention adjourns until tomorrow morning. We rush our film into the lab. and the boys develop it that night. Our man who was crabbing about Movietone finds there is plenty of room in the crow's nest with them.

The next day's session finds us set up near the broadcast boys. Their work is very interesting to me; but I can't stay there long as one of the ushers tells me I am blocking the view of some of the dignitaries who are seated back of the speaker's stand. I have already made a couple of shots, so do not mind moving. I go to the opposite end of the hall and set up in one of the band stands.

This band seems to have its own concessionaire and I am invited to participate in the cold drinks, which are more than welcome. Another demonstration takes place and I get some good long shots. Adjournment seems to be in order so we strike the outfit and back to the lab. The heat is awful and the boys are working in their B. V. D's and we follow suit. We have so many prints to ship each day we keep the boss broke in buying air mail stamps. We are short of cans. The boss telephones to New Orleans. Yes, they will send us 200 right away. Shipping boxes are running low, also. We hotfoot it to a local box factory and in about two hours return with the back of the car filled. One of our boys had bad luck. He was leaving the hall with his magazine when someone knocked the magazine from his hand and it fell open on the ground, ruining the film. He had some good stuff in it, too. I always keep my magazines taped.

Each session is about a repetition of the one preceding it. Speeches and demonstrations. Shooting and making prints. A photographer cannot take as much interest in the proceedings as he would like to—he must take his pictures and get them into the laboratory as soon as possible. Speed is the essential thing.

100 Percent A. S. C.



Here is a shot from the Oakland Airport, where Harry Perry, A.S.C., and his able lieutenants, E. Burton Steene, A.S.C., and Elmer G. Dyer, A.S.C., have been busy for several weeks doing aerial work for Caddo's epic of the air, "Hell's Angels." The picture shows Mr. Dyer at his battery of cameras ready to go aloft, while Chief Perry is giving final orders. Gaetano Gaudio, A.S.C., was chief cinematographer on the dramatic sequences of this never-ending masterpiece. The picture is therefore 100 per cent A.S.C.

Sound Hits Hades

The Hollywood citizen had just arrived in Hades. "Where can I find a picture show?" he demanded of a native.

"The Brimstone Theatre is just over there behind the Asbestos Works," grinned the native.

The H. C. bought a ticket and sat down to enjoy himself. There was an orchestra, an organ, a jazz band and a lot of canned vaudeville. The film entitled, "Pandemonium," was full of spoken subtitles and sound effects but there were no pictures on it. The H. C. grew restive. After a while he called an usher.

"Are you tryin' to kid us," he asked with acerbity.

"Whaddyamean kid you?" countered the usher.

"They ain't no pictures on this here film," sobbed the H. C.

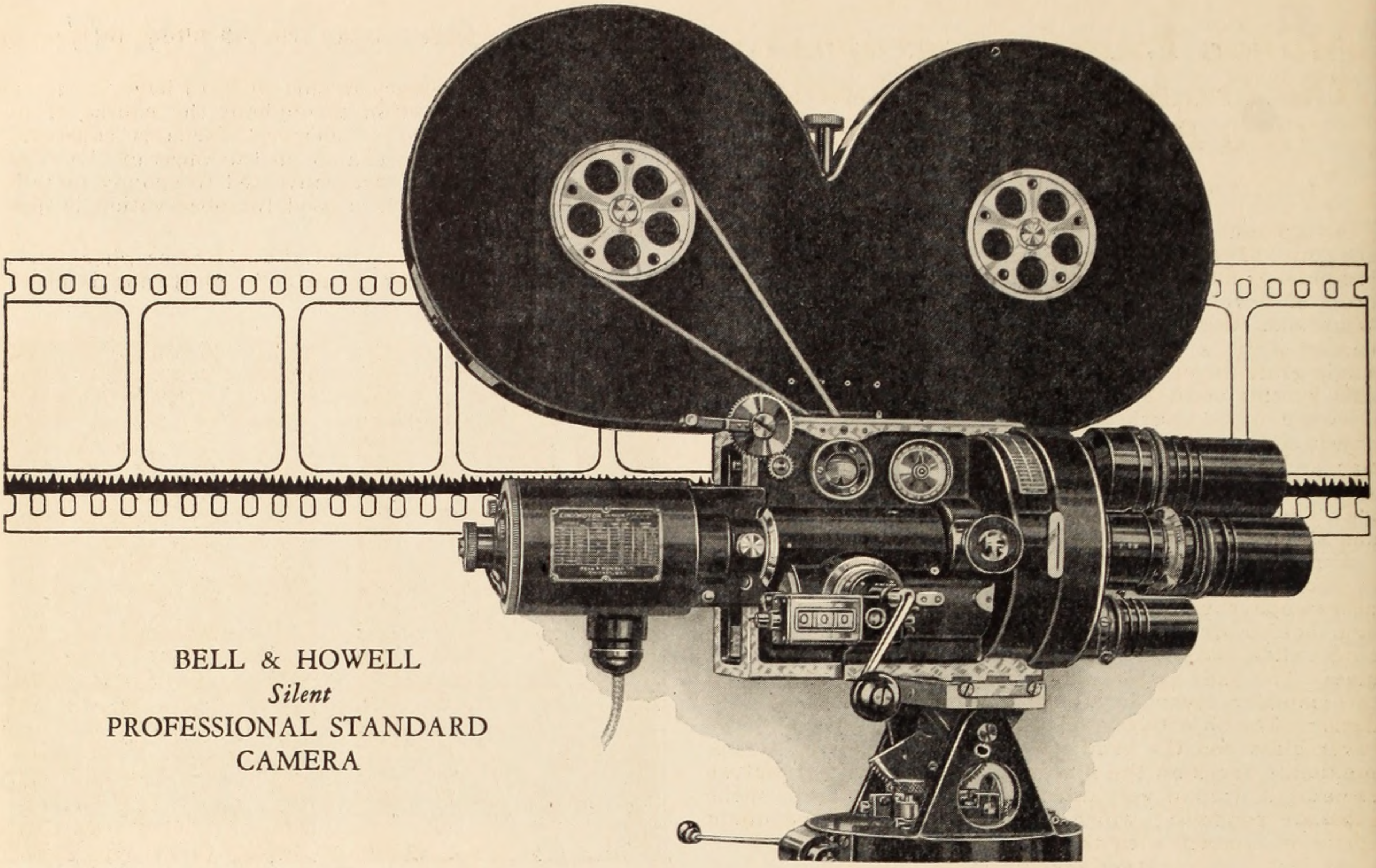
"Pictures? Whaddye expect for $1.65," yelped the usher.

"Ya mean to say ya got nothin' but sound here," wailed the H. C.

"Sure. We strive to be up to date," smiled the usher with great complacency.

And as the H. C. stumbled out the little devil in the box office thought she heard him mumble: "This IS Hell."

Oliver Sigurdson, A.S.C., has moved his still outfit from the Pathe Studio to Metropolitan. Oliver is one of the great artists of the still camera in the cinema world.



BELL & HOWELL
Silent
PROFESSIONAL STANDARD
CAMERA

THE INDUSTRY'S CHOICE

for Sound Recording Purposes

FOR over thirty years "silent" movies have advanced irresistibly toward perfection. Great minds have given their best, with results that surprised the world. Standardization of film and film machinery, so largely sponsored and made practical by Bell & Howell engineers, played an indispensable part in moviedom's reaching the great heights which it holds today. The vista still looks upward. Greater heights are just beyond. Movies synchronized with sound first amused the world as a passing experiment—then astounded the world with their mechanical perfection. The "Talkies" have arrived.

In the same *pioneering* spirit of twenty-one years ago Bell & Howell were first to make cameras for sound recording purposes. For more than five years Bell & Howell engineers have been experimenting, refining, perfecting, and collaborating. Bell & Howell Standard Professional Cameras for sound recording purposes have been made so *silent* that some studios dispense with soundproof booths in operating them.

In short, so successful have been the results that the following leaders in development and production of talking pictures use Bell & Howell Cameras almost exclusively:

Bell Telephone Company
Bristol Company
DeForest Phonofilms, London and U.S.A.
Fox-Case Corporation—Producers of Movietone
General Electric Company
Hal Roach Studios
Metro-Goldwyn-Mayer
Paramount-Famous-Lasky
Powers Cinephone Equipment Corporation
R. C. A. Phototone, Inc.
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Western Electric Company
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Write us for detailed descriptions, technical information or prices.

BELL & HOWELL CO.

1805 Larchmont Ave., Chicago, Ill.
New York, 11 W. 42nd St. **Hollywood, 6324 Santa Monica Blvd.**
London (B. & H. Co., Ltd.) 320 Regent St.
Established 1907

Motion Photomicrographs of The Progress of Development Of a Photographic Image

By CLIFTON TUTTLE AND A. P. H. TRIVELLI*

An account was recently published by E. P. Wightman and one of us[1] concerning the development of silver bromide grains. Motion photomicrographs of the progress of development were made at that time by E. P. Wightman, using a four mm. water immersion objective immersed in a drop of dilute developer placed on a single-grain layer plate. The optical resolution obtainable by this method leaves much to be desired, and the presence of so much liquid between the objective and object slide gives rise to difficulties resulting from vibration and striation. Recently a method has been devised which permits the use of a 1.8 mm. oil immersion objective. The consequent resolution is considerably enhanced and the difficulties of the former method are minimized.

For the purpose of this study, single-grain layer coatings of a pure silver bromide emulsion are made on microscope cover glasses 0.18 mm. in thickness. A 15 mm. hole is drilled through the center of a microscope object slide and over this hole is cemented a coated cover glass. The slide is placed on the microscope stage with the emulsion layer downward toward the substage condenser. The objective is oiled to the upper surface of the cover glass and the grain images are brought to an approximate focus on the film aperture of a motion picture camera. A drop of very dilute developer* is placed on the substage condenser which is racked up until the liquid comes in contact with the emulsion surface.

Developer Formula

*Elon	0.5 grams
Sodium sulfite	7.5 grams
Sodium carbonate	2.5 grams
Potassium bromide	0.15 grams
Water to make	150 cc.

Although a slight adjustment is necessary after contact is made between developer and emulsion, it is found that the image can be brought to a sharp focus before any appreciable action has taken place. The motion picture record thus shows almost the entire progress of development. The preliminary focusing is accomplished by red light (No. 25 filter) to prevent excessive photodecomposition of the grains. The exposures are made by light of shorter wave-lengths (No. 49 filter) to increase resolving power.

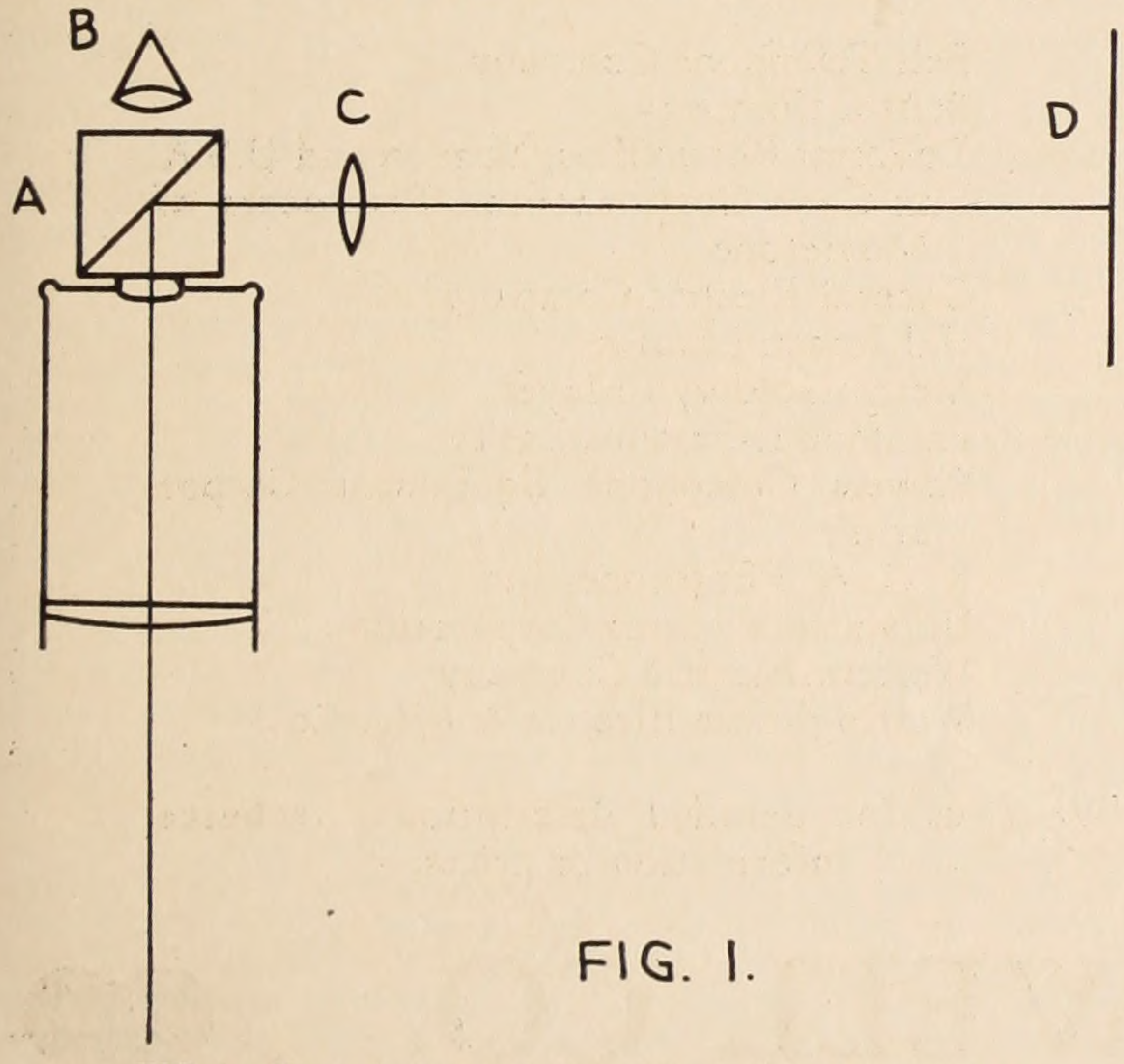

FIG. I.

FIG. 1 View finder and focusing device for use in motion photomicrography.

It was found necessary in this work to have the image under constant inspection throughout the course of development. The plane of sharpest focus is constantly shifting because of the change in thickness of the silver bromide grains as they are converted to spongy metallic silver. The means which is used for observation is illustrated in Fig. 1.

A beam splitter A composed of two prisms whose interfaces have been silvered by cathode sputtering is placed over the ocular of the microscope. Optical contact between prism and eyepiece is made with a drop of cedar oil. About 10 per cent of the image light is transmitted to the eye at B while approximately 85 per cent is reflected to the motion picture film at D. The light which enters the eye is approximately parallel and the observer focuses on a virtual image at about 25 cm. distance. The reflected parallel light is brought to a focus in the plane of the film by a simple lens (C) of the correct power. In this case, a 4.5 diopter lens is used at C and the distance from C to D is adjusted so that the real image focus is identical with the virtual image focus. A 10X hyperplane eyepiece was used and the magnification on the film was about 900X.

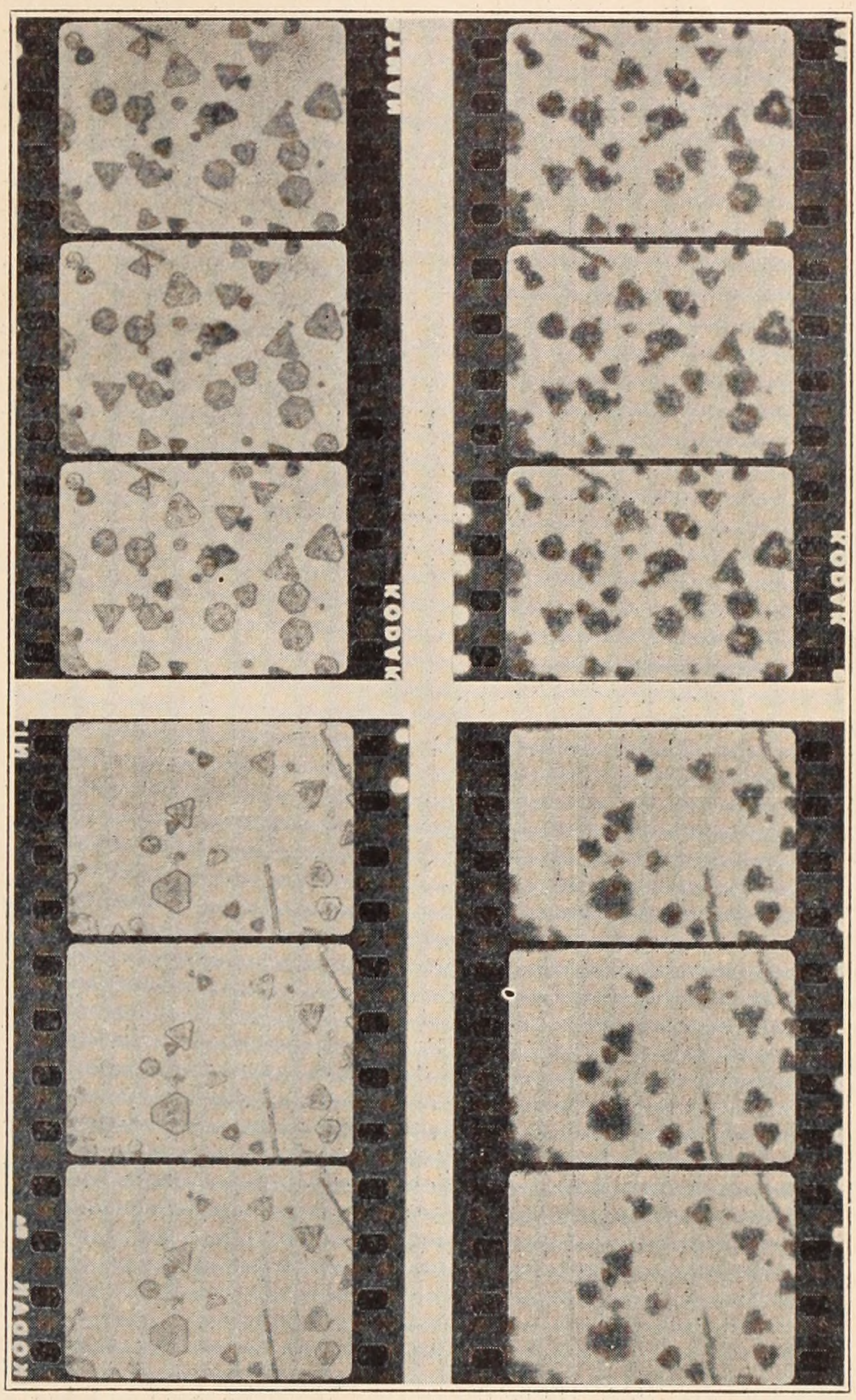

FIG. 2 Silver bromide crystals before (left) and after development.

It was found that light of sufficient intensity could be obtained from the 6-8 volt, 108-watt ribbon filament lamp overvolted to operate at 20 amperes. Pictures were made at the rate of four per second (one-fourth normal

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* Communication No. 341 from the Kodak Research Laboratories.

[1] Photography through the Microscope, by E. P. Wightman and A. P. H. Trivelli. American Annual of Photography, 1928, page 11.

Sound Film Processing

By J. W. Coffman

Vice-President Carpenter-Goldman Laboratories, Inc., Long Island City, N. Y.

The West winds bring us tidings of an art that is newly born—sound pictures have made their advent, and Hollywood is telling the world in its usual hearty way. Apparently not all the celebrants wholly enjoy the festivities, since we hear of players' frantic efforts to be vocal and of directors who find pantomime rather cramping to their style.

But notwithstanding the present lusty cries from the cradle, the art need not long remain in swaddling clothes, as all the elements for rapid growth are at hand.

The stage will teach the players how to talk, and revengeful players teach directors the fine art of pantomime. The telephone industry offers thorough knowledge of speech and its reproduction, while radio can solve the problems of studio technique and design. And forty years ago the basis for solution of the photographic problems involved was laid by Hurter and Driffield, whose methods a number of our own members have helped perfect.

Up to the present, sensitometry, as outlined by Hurter and Driffield, had not received the attention it deserved from the industry, and for enforcing that attention now, the sound film will probably earn the eventual gratitude of the laboratories.

Today, sensitometric tests to determine developer characteristics are an important part of routine sound film processing, particularly in the case of records made by variable density systems.

Unit overall contrast, or gamma, of the sound print is the goal at which are aimed all efforts at control of the processing of variable density sound tracks. Needless to say, the accompanying picture must be conformable to accepted standards for regular motion picture prints. Overall contrast considerably greater than unity is usually desired in the picture so the picture negative is ordinarily developed to a higher gamma than is the sound negative. Normal development of silent picture negatives is to a gamma of approximately .80 and normal development of the prints is to the vicinity of 1.80 so that the overall gamma of the usual silent picture seen on our screens today is approximately 1.4.

If the picture negative and print are to be developed according to these silent picture standards, then the accompanying sound negative should be developed to a gamma of approximately .56. Overall gamma being equal to the product of negative gamma by positive gamma, development according to these specifications would give an overall sound track gamma of unity and an overall picture gamma of 1.4.

Negative gammas as low as that indicated for the sound track have not been frequent in silent picture practice, and the "old timer" is inclined to consider a sound negative of these characteristics very "weak" or under developed. But quite satisfactory variable density sound prints have been produced when these factors were used. It is probable, however, that the trend of laboratory technique will be in the direction of higher gamma for picture negatives, particularly if there become available negative emulsions permitting of higher gammas without the high density now associated therewith. Such emulsions should, of course, retain the wide latitude and fine grain structure of the present negative emulsions. They should possess low exposure inertia, since most sound pictures are photographed with relatively low intensity incandescent lighting, and should preferably be panchromatic. An emulsion with these characteristics is admittedly much easier to define than to produce. But if obtainable, it would make practicable the development of picture negatives to a gamma considerably higher than that previously stated. The sound negative could then be developed to a higher gamma, producing a denser negative than that now being obtained. This would tend to reduce the level of negative ground noise by reducing the ratio of base density to overall density. In a sufficiently dense sound track negative, variations in base density become insignificant as compared with variations due to modulation of the track.

Cameramen vary widely in the lighting of sets, depending upon the laboratory to modify the original contrast to that value which produces the most pleasing pictorial result. This makes it difficult to standardize on the gammas to be used unless the cameraman's technique is well known. It is frequently advisable to develop the picture negative first, securing what would be considered a good negative according to straight pictorial standards. Test prints are then made to determine the most satisfactory time of development for the print, pictorially considered. Sensitometer strips are printed on each of these tests and the gamma of the most satisfactory print is determined by measurement of the sensitometer strip densities. The reciprocal of this print gamma is the gamma to which the sound negative should be developed.

For example, a certain cameraman is inclined toward rather flat lighting of his sets. His negatives, developed to a gamma of .80, require prints of a gamma of 2.00 in order to give what he considers satisfactory results. Unity divided by 2.00 gives .50 as the indicated gamma to which the sound negative should be developed.

The same technique can be applied to the determination of the most satisfactory gammas for the various negative and positive emulsions which may be used. The sound track can be given its theoretically perfect photographic characteristics without causing picture quality to suffer in the slightest if these relatively simple precautions are observed.

These observations apply only to variable density sound-films in which the sound and picture impressions have been recorded on separate films and combined to make a single print. If separate prints of the two records are to be made, or if a print of the sound record is desired, then the simplest and most satisfactory technique is to develop both the sound negative and the print therefrom to a gamma of unity. The picture is treated as any silent film would be, except that care must be exercised to prevent breaks and splices. Where sound and picture impressions are recorded on the same negative, it is necessary to develop them together, both as negative and print. Some compromise with quality is apparently unavoidable under these circumstances.

The variable width system of sound recording is not so dependent for quality upon accurate sensitometric control of development processes, but even here it would seem desirable to have sensitometric data always at hand. The positive sound track should have the maximum possible overall gamma, while the picture quality should remain unaffected. While definite values for gamma need not be prescribed, the requirements indicate the advisability of developing the sound negative to approximately gamma infinity, and the combined print to a relatively high gamma. The picture negative should then be developed to a rather low gamma to prevent the overall picture contrast from going too high.

Methods and equipment for sensitometry are not within the scope of this discussion:—suffice it to say that neither in point of time nor money are sensitometric methods costly to the film laboratory. Actually, the saving in cost of reprints and the improved quality of the product should amply compensate for all the necessary expenditures.

Machine processing is rapidly coming to the fore, and with its ally, sensitometry is forcing a rather hasty retreat by the "old timer" with his racks and tanks, his secret formulas, and his undisputed good judgment. Machine processing is almost essential to the controll-

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This article was originally presented at the Fall convention of the Society of Motion Picture Engineers held at Lake Placid, N. Y., September 24-28, 1928.

ing of development and the securing of uniformly satisfactory results.

It is true that the exercise of extraordinary care, fair negatives and prints of any type of sound film can be produced by rack-and-tank methods, but the extreme painstaking requirements and the difficulty of controlling the results give rack-and-tank methods a poor efficiency rating as compared with machine methods. At best, rack-and-tank prints will hardly equal the quality of routine machine prints, because some imperfections, due to splices, rack marks, and developer variations, inevitably appear on the rack-and-tank product.

The disc system of sound synchronization make fewer demands for modification of laboratory technique than do the film systems, but even here the machine has great advantages, for the entire reel can be processed as a unit, eliminating splices with their attendant dangers to synchronization. Bearing in mind that scratches, dust spots, finger prints, etc., cannot be cut out of these negatives and prints without replacing the sections removed, the superiority of the developing machine becomes even more evident.

Developing machine design should provide for complete control over all factors affecting quality of product. Reserve developer tanks should be of the largest practicable capacity in order to keep to a minimum those variations due to developer exhaustion. Continuous circulation from these tanks into the developer tanks of the machine is, of course, to be provided for. Thermostatic control of developer temperature, within limits of one degree is highly desirable. A thermostat in the machine developer tank may be arranged to control a two-way valve in the developer feed line so that a rise or fall in temperature will cause the valve to bypass some of the developer through cooling or heating coils as may be required.

At least three developer circulation systems are needed:—one each for sound negative, picture negative, and prints. Print developers generally used in developing machines are too contrasty and contain too much Potassium Bromide to be of use in developing sound negative on positive stock, hence the necessity for the separate developer for this purpose. Sound negatives recorded on the same film as the picture are necessarily developed in the picture negative bath.

High concentration developers are desirable for sound-film work in all its phases, for they produce more nearly uniform results and require strengthening or renewal less frequently. Potassium Bromide, since it tends to alter the contrast relationships of the various intensities of exposure, should not be used in negative developer formulas, and should be held to a minimum in print developers.

The less-basic alkalies should be used in most developer formulas, and the concentration kept relatively low, thus permitting higher concentration of the developing agent and longer time of development. Both these factors tend toward greater uniformity of result. Modifications of the Eastman Borax developer formulas have proven very satisfactory for negative development, for both sound and picture negatives.

The borax developers tend to produce a fine-grained negative which is especially desirable on the sound tracks, since the high-frequency limit is established by the limit of resolution of the film, and this, in turn, is largely dependent upon grain-size.

It has been found desirable to use a stop-bath in the rinse-tank, through which the film passes immediately after development. Otherwise the developer is not entirely removed from the film, and tends to drain down from the sprocket holes upon the sound track, making stains scarcely visible to the eye, but picked up by the photo-electric cell in the reproducer as a distinct ninety-six cycle hum. No trouble from this source is experienced when the stop-bath is used.

Efficient printing is one of the greatest problems now confronting the sound film laboratory. The sound track must be printed on a continuous printer while the picture may be printed on either continuous or step machines. Present practice usually involves separate printing of the two impressions whether or not they were recorded on the same film. The apertures are complementary to each other, the one making the section through which the other prints. This necessitates two runnings through the printer, as now arranged. To secure the maximum sharpness in the very fine lines representing the higher frequencies, it is necessary to reduce the aperture slot to very narrow dimensions, and this, in turn, produces a marked fluctuation in lighting of the sound track due to gear and belt back-lash, etc. This could be overcome by installing a mechanical filter on the printer sprocket drive, thus smoothing out the small irregularities of speed. A filter of this nature should be connected to the printing sprocket by a positively acting clutch, thus permitting the starting and stopping of the film without the handicap of overcoming the inertia of the filter flywheel. Addition of a mechanical filter would tend to eliminate also the flicker now frequently noticed in pictures printed on continuous printers.

Mislights are very troublesome in sound prints, usually meaning the reprinting of the entire scenes. Since scenes are usually much longer than in the silent pictures this is a rather costly operation. Light-shifts now in use are not wholly satisfactory from this standpoint, having varying degrees of propensity for mislighting, and being hardly rapid enough to shift the lighting of the sound track without a density change which will be reproduced as noise.

Light-shifts which depend upon a change in the resistance of the lamp circuit tend to cause a slight change in the gamma of the prints, the lower wave-lengths tending to produce higher gamma due to their deeper penetration of the emulsion. This variation is not large enough to be of serious moment; but it is probably better to look toward a light shift in which the actinic qualities of the light remain unchanged. These defects in existing sound track printers may be fairly easily overcome; but it would seem expedient to redesign the entire printing machinery now while the industry is new. Practically all the requirements are known—and the laboratories cry for assistance.

In adapting existing continuous printers for sound track printing, care should be taken that the aperture masks make contact with the film along the side as well as at top and bottom; otherwise light may leak from the picture aperture to the sound track, and cause many strange noises. Identification marks should be eliminated from the sound track side of the print for the same reason. These light leakages are seldom apparent to the eye, but they are very distinctly apparent to the ear. It seems best to mask off the sound printing aperture one or two mils from the line of sprocket holes; otherwise refracted light from the edges of the perforation sometimes affects the sound track, producing the characteristic ninety-six cycle note, or "sprocket hole hum."

In printing, it is necessary to displace the sound track on the print to compensate for the separation of the sound and picture apertures. There seems to be a tendency to agree on a fourteen-and-a-half inch advance of the sound track as the standard displacement. A convenient laboratory device holds the original synchronization mark by sprocket pins at this distance from a film punch, which is operated to make the new start mark. This is only one of a series of minor laboratory appliances which the new art is bringing in. The list includes synchronous rewinds, butt-joint splicers, negative splice punches, positive splice blackers, film hooks, and various other strange-sounding devices.

Inspection of first prints should be under conditions approaching those of the theatre as nearly as possible. This requires a completely-equipped sound film projection room with a screen room of adequate size and correct acoustic characteristics. The inspector needs have an ear for tone quality as well as an eye for visual quality. Routine inspection of subsequent prints may be carried on with a simplified equipment consisting of projector with sound pick-up, a small amplifier, and headphones. This inspection is not primarily for tone quality, but for defects such as volume variations, "sprocket hole hum," dust or splice noise, etc.

It comes as something of a shock to the laboratory man to discover that he can no longer depend upon his eyes to judge the quality of laboratory work upon a sound film. Sound tracks frequently appear to be perfect to

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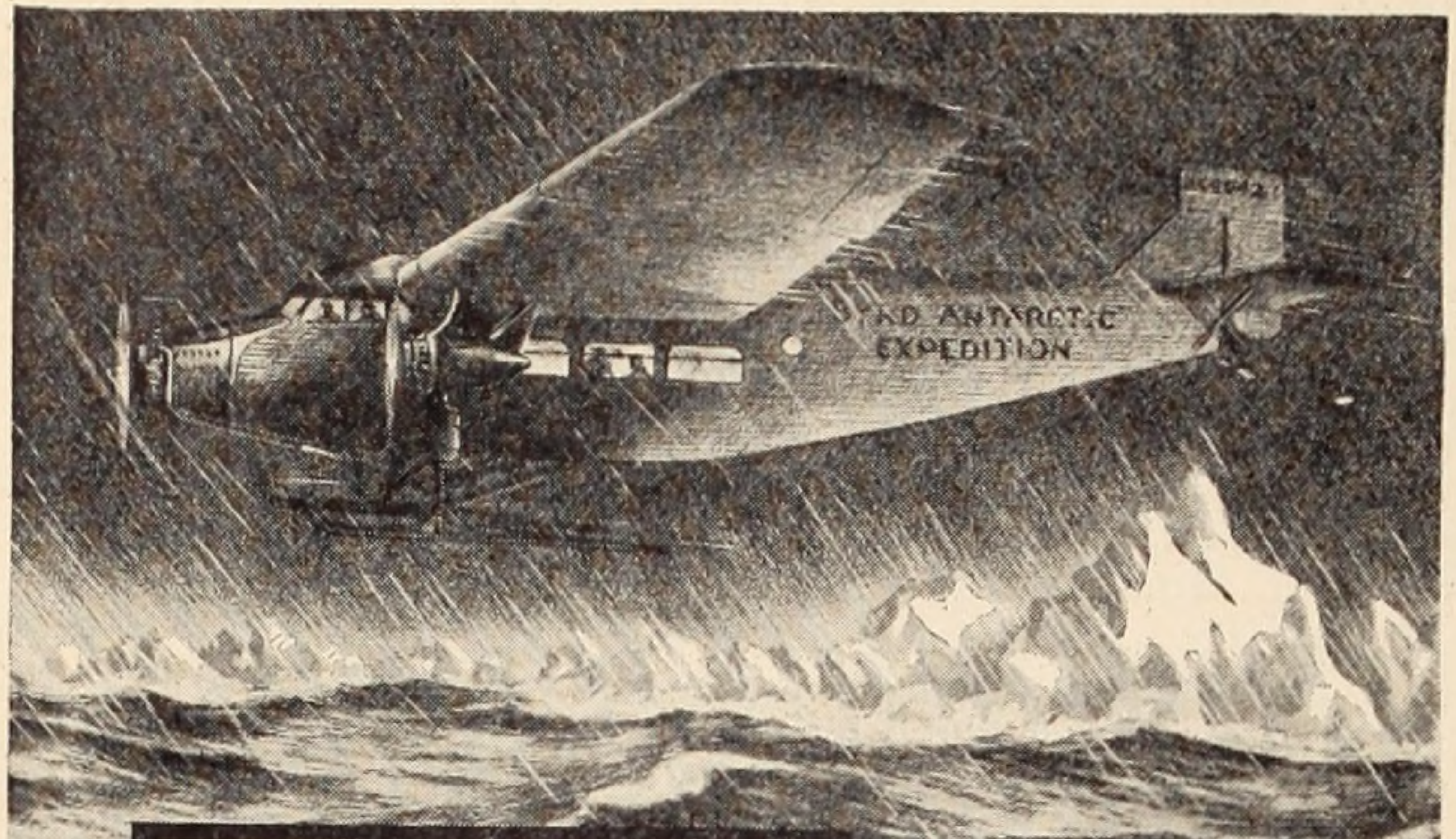

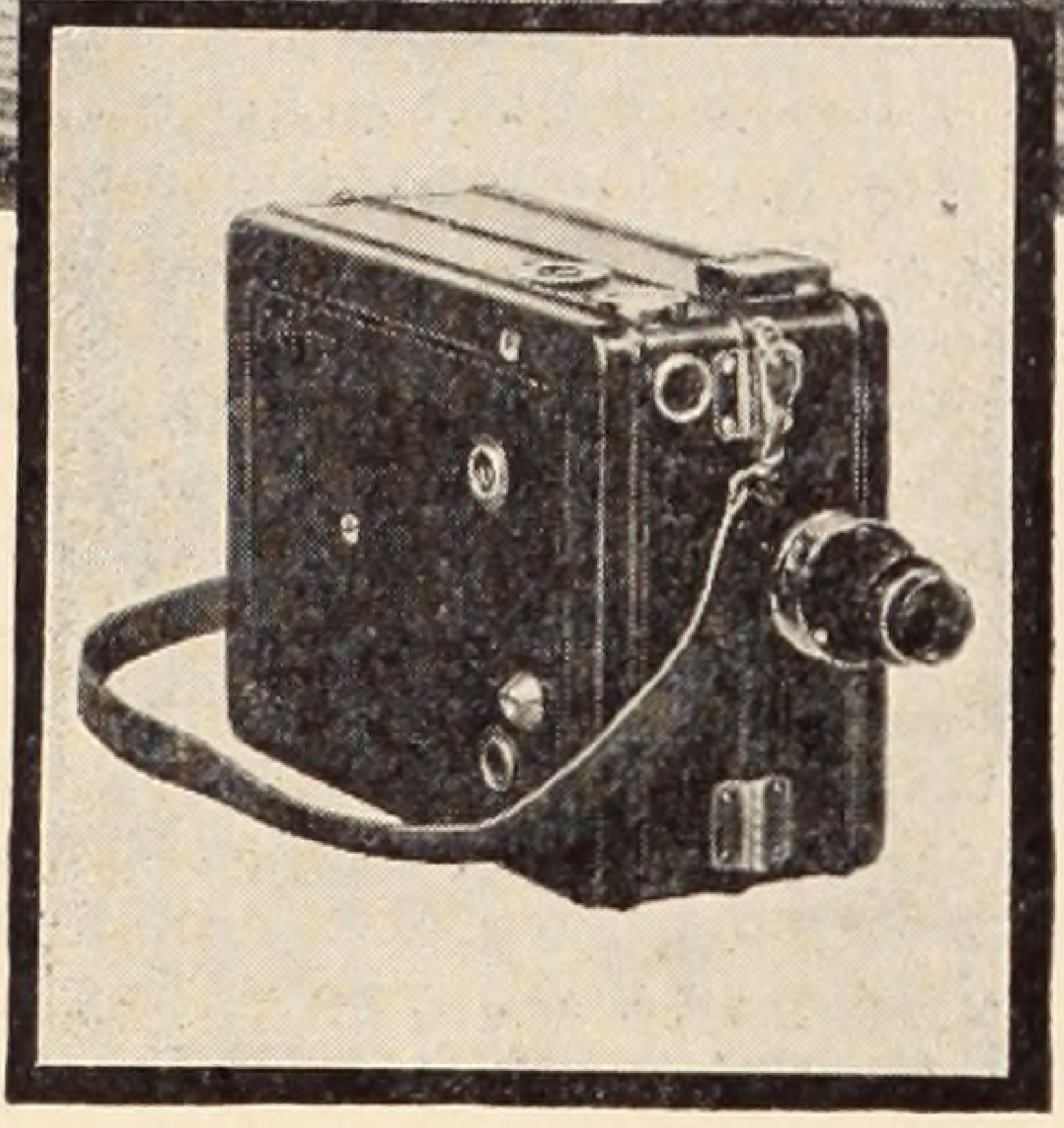

With Byrd

in the Antarctic

THREE De Vry Standard Automatic Movie Cameras were purchased by Paramount-Famous-Lasky Corporation, for use on the Byrd expedition, now on its way to the Antarctic.

What a world of significance in that simple statement!

Consider the exceedingly unfavorable conditions under which pictures will necessarily be made. The sub-zero temperatures of 30 to 60 degrees prove the confidence of professionals in the mechanical superiority of the De Vry. The selection of De Vry cameras is a striking tribute to the excellence of their photographic results.

De Vry is the personal movie camera of those who know, professional in its results, but amateur in simplicity of operation. Holds 100 feet of standard 35mm. film, which may be used on any standard projector, or reduced for 16mm. projectors.

Send now for free literature and details of DeVry Motion Picture equipment. No obligation, of course.

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DeVry

World's Largest Manufacturer of Standard Motion Picture Cameras and Portable Projectors

Putting It Over

Minneapolis, Minnesota,
November 22, 1928.

John W. Boyle, President,
American Society of Cinematographers,
Suite 1222 Guaranty Bldg., Hollywood.

Delivered two lectures here today and tonight one before the student body of the University of Minnesota and one before the faculty, advanced students and various scientific bodies stop Was extended most enthusiastic reception and given many assurances of appreciation stop The special film so kindly contributed by A.S.C. members in the Hollywood studios was huge success and we held the floor over five hours during the two sessions stop President Coffman of the University and J. C. Lawrence his assistant were most gracious and afforded me every possible facility stop I am sure this contact will prove of the greatest benefit to the A.S.C., to the industry and to cinematography in general. Regards to all,

Joseph Dubray.

Board of Editors Revived

At a recent meeting of the Board of Governors of the American Society of Cinematographers, the Board of Editors, an advisory body to work in connection with the Editor-in-Chief of the American Cinematographer, was revived with Victor Milnor, Chairman, John Seitz, Hal Mohr and Alvin Wyckoff associates.

To the South Seas

George Schneiderman and Daniel B. Clark, respectively treasurer and member of the Board of Governors of the A.S.C., will depart soon for the South Seas under sealed orders to film a special opus for Fox. As they expect to be away indefinitely their official places will be filled during their absence by Hal Mohr and Al Gilks. Mr. Mohr is new to the Board, but Mr. Gilks is a former member. Mr. Schneiderman has long been treasurer of the Society and Mr. Clark preceded John W. Boyle as president.

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the eye, but to the ear are horrible examples, full of distortion and extraneous noises, all of which can be remedied by correct laboratory procedure. On the other hand, a sound track may be very discouraging to the eye, full of seeming scratches, rack marks, printer flicker, etc., and yet it is reproduced as a nearly perfect auditory record, clear and undistorted, with an almost imperceptible noise background. These reversals of customary standards of judgment are sometimes discouraging, but they add to the thrill of the laboratory man's existence and carry to him forcibly the conviction that "To measure is to know."

The Conference Habit

The Great Bunk Institution of the Motion Picture Industry

By James H. Collins

Author of "Human Nature in Selling Goods," "The Art of Handling Men"

[*This applied to the motion picture industry, so long a sufferer from conferencitis, would accomplish wonders in the way of efficiency, while saving endless irritation and unfriendly feeling. Mr. Collins' article is a reprint from the Lion's Magazine—Editor's Note.*]

At 10:00 A. M. they told him Smith had not arrived, so he said he would look in again later. At 11:15 they said Smith had come in and gone out again. At noon they told him that Smith could not be seen—he was in conference.

The visitor said that he thought Smith would be glad to know that he was in the office. Would they telephone his name in? But subordinates were firm. The idea of interrupting a conference! So the visitor said he must try to see Mr. Smith some other time, and left his card and departed.

When Smith came out of the conference and saw that card, he went through the ceiling. For the visitor was purchasing agent for a large western company and had dropped in to see Smith on his way home from a buying trip, because he liked the kind of fellow Smith was and the cordial letters he wrote—which were very different from the stereotyped "Mr. Smith can not be interrupted—he is in conference."

Do you suffer from the great American conference habit?

This habit has been growing amazingly the past ten years. Originally it started with the very good idea that because business organizations were spreading out and personal contact difficult to maintain, teamwork could be promoted by bringing the men together every so often from departments and branches.

But nowadays, wherever two or three are gathered together in everyday routine talk, that is sanctified by the term "conference." And a man in conference is supposed to wear a cloak of inaccessibility. Nothing else on earth counts.

In most cases, this is pure camouflage!

Nine conferences out of ten are debating societies and rest cures. They are debating societies because, when more than two or three men undertake to discuss business matters without the strong control that ought to mark a real conference, they simply talk around the bush, and destroy concentration. And, because not one conference in ten is held to a strict program by an executive who knows where to start and when to leave off, the net result usually is a letting down of mental efficiency that makes the conference restful, but nothing more.

The most efficient business nation in the world, undoubtedly, is England.

The American lands in London, anticipating a series of world-beating conferences, and is told that at 2:10 P. M. Wednesday afternoon Sir Charles Smith will see him for fifteen minutes. The appointment is sacred. Sir Charles is waiting, and promptly turns out the previous visitor, and finishes with the American on schedule. All the facts must be summarized so that Sir Charles may give his decision. It may be a matter of millions involving concentrated affairs on the other side of the world. It is decided with a clearness and definiteness that makes the American head go round—and thus Sir Charles is able to spend Friday noon to Tuesday morning at his country home.

Not long ago a new manager took charge of a business so hypnotized with the conference idea that it was falling to pieces. Able men were quickly lost because they could get nothing done. No matter what project was proposed, the conference crowd held an autopsy on it. The bigger it happened to be, the greater the necessity for careful consideration, they said. A preliminary conference debated the matter, and clearly brought out all the objections against it, and reduced initiative and energy to doubts and delays. Then all the misgivings were handed over to sub-committees, who held other conferences upon them, until finally the project was set aside altogether, to wait until times got better or the weather changed. That business had degenerated into an organization of debating clubs.

What the new manager did was very simple. Going back to first principles for debating societies, he applied ordinary parliamentary rules to hold discussions on the track and run it on schedule, and wielded the gavel on anybody who tried to wreck the train or lead it off on a ramble through the woods. He cut down the number of conferences, and made those that were necessary thoroughly unrestful by humorous and caustic comment for the fellows who doubted and dissembled.

When a subordinate attended one of this manager's conferences, he got enough things to do to keep him busy a week, with full authority to carry them out and the obligation to come into the next conference bringing results.

Best of all, he utterly destroyed the myth about the sanctity of a conference. No western buyer ever showed up in that office to see their Mr. Smith and found Smith inaccessible. Five minutes before a conference started, the manager's secretary took her station in the general reception-room. She was there to represent the manager—and nobody who ever had business with that concern slipped out of her memory. She knew faces and names, and would recognize a voice over the telephone a year after she had last heard it. She was even more solicitous about a stranger than in taking care of some visitor she knew.

Had that Westerner turned up to see Smith, she would have called Smith out. Better than that, she often sent the visitor into the conference room, and there he saw his man and met other men of importance in the company, and perhaps brought live information and a fresh outside point of view upon the matter they were conferring about.

Two Boy Adventures Make Trip Around World

Two youthful nomads, sons of wealthy parents, on a trip around the world in a fifty-foot sailboat, on which they start this month, will make complete motion picture studies of the entire cruise, using only the portable type DeVry cameras. The boys, both about 25 years of age, are Daniel C. Blum, of Chicago, and Stephens Miranda, of Los Angeles, California. They will sail to every principal seaport in the world and in and out of every navigable stream in a voyage that they plan will take them from three to five years to complete.

The young adventurers are now in Seattle, fitting up the boat for this thrilling trip. They have purchased a Norwegian double-ender sailing yacht, The Valkyrie, from Count Holstein-Rathlou, a Danish nobleman, of Victoria, B. C. The craft has been re-christened "The Nomad" and is being altered to suit the youthful globe circlers. They will sail from San Francisco as soon as the craft is revamped to suit their specifications, making the cruise under the sponsorship of the St. Francis Yacht Club of San Francisco.

Fox's First 100 Percent Talkie

It has just been discovered that modest George Meehan, A.S.C., was the cinematographer who photographed Fox's first one hundred per cent sound picture, "The Ghost Talks." This is the first Movietone feature production. It was directed by Lou Seiler and featured Helen Twelltrees, Charles Eaton, Earl Fox and Carmel Myers. This picture will be up for unusual inspection and criticism and Mr. Meehan's work will do much to put it over. He was also the cinematographer on the Fox Movietone short that has been stopping the show whereever it has been shown— Chic Sale, in "Marchin' On." This picture, though a short, has received the most favorable comment of any talkie to date and is ballyhooed by the exhibitor like a feature.

A Photographic Paradise

There Are Still Places on the North American Continent Where Wild Things Are Unafraid and the Camera Is Only Weapon Used

By ALVIN WYCKOFF, *A.S.C.*

President International Photographers of the Motion Picture Industry

British Columbia and Alberta, western provinces of the Dominion of Canada, are vast territories, conceded by many photographers to be the photographic paradise of the North American continent.

In this wonderful area of the Dominion there are vast level plains and mountains as yet unsurveyed, waiting to be introduced to man and his ways, which will remain in their present state for several generations.

The plains of Alberta are impressive, teeming with the life they have always known and nourished, while the mountains of both provinces are sublime in their grandeur, affording "Gardens of Eden" for the native animal and bird life that have reared their kind undisturbed for ages past, without fear or want save that which is generated among their kind. Man—a strange animal, is met with amazement and curiosity, and in some instances (as with the Grizzly bear) with resentment.

On the plains roam thousands of wild horses that have never experienced the touch of a hand, and many that have never viewed other than their kind; antelope, swift, graceful and curious; badger, wolf, and coyote mingle together undisturbed.

Here, also, is found the native man of this continent, holding forth his religious ceremonials in the appointed festive seasons—the Indian—in all the majesty of his past romance—gathering from distant reservations, reviving and performing the rites of old, erecting council lodges, conducting inspiringly his ancient rituals of homage to the Supreme Spirit of his creed.

Wild flowers of gorgeous beauty and simplicity, with here and there a riot of color that seems to awaken with the early dawn of each new day, heralded by the glorious sunrise, and again to go to rest with sunset of golden glow.

Rivers, born high up in the mountains at the base of glaciers that have given them life for centuries, sending them roaring and tumbling down over precipices and through dark gorges, spending their power against mighty granite cliffs till they come to rest in the vast plains below, winding on till they are lost in the big inland lakes to the east or mingling their waters with the Pacific on the west.

Famous Alpine and native guides will conduct you safely to the heights above the famous resorts of Lake Louise and Banff Springs, where you can behold the wonders of the work of the Almighty, touched here and there by His Mind through the agency of man's handiwork.

Beautiful, idyllic mountain lakes, fed by springs of sweet water, reflecting on their surfaces high snow-capped peaks that keep them within bounds, in turn giving a home to the gamest fish to be found anywhere in fresh water.

Canadians, Englishmen and Americans, all mingling together, extending a hospitality that cannot be experienced in greater sincerity anywhere else in the world.

At Calgary, in the province of Alberta, a holiday season is declared each year in the month of June, known far and wide as "The Stampede." Throughout the year this festive season is planned and talked of by good British subjects and other nationalities all over the world, and drawn to this focal point each year are the champions of the earth, representing present and past days of frontier life—to compete and carry off rich prizes and honors offered. Products and handiwork of the western Dominion are on exhibition, proving the riches and opportunities of an empire waiting to be developed in greater abundance, under the guidance of a handy and prosperous people. Here is throbbing life and vivid color, not to be found at any other time or place in all the world. Indians in wonderful gala attire, ranchmen, soldiers, stockmen, cowboys and the Royalty of the Realm; wild cattle and wild horses; bands of music; wonderful entertainments, and peoples of all the world renewing acquaintances of past meetings at this same celebration.

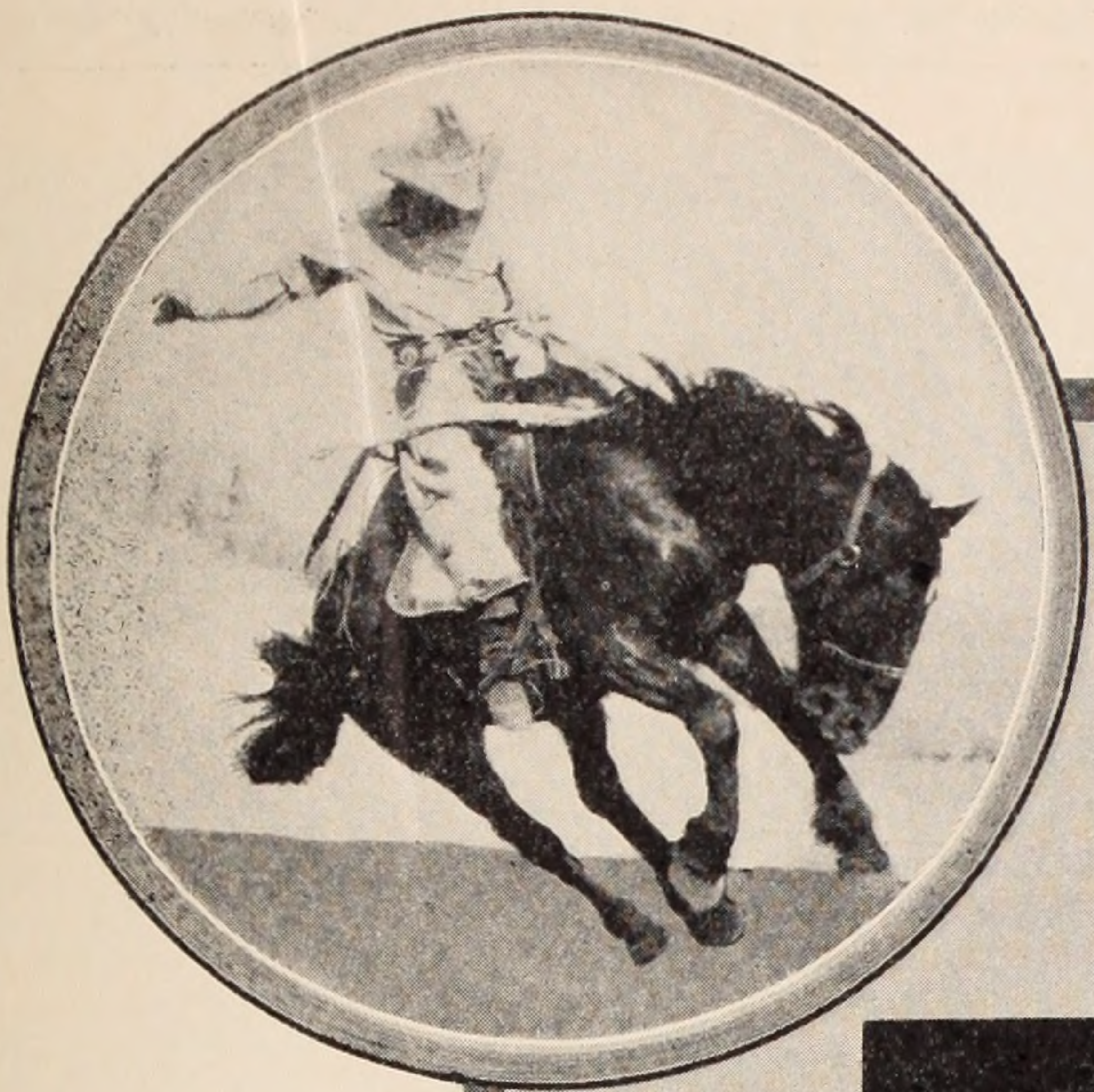
It was the writer's good fortune to be selected to fill the position of chief cinematographer in charge of all photography by the British-Canadian Pictures, Limited, a company formed for the purpose of making a feature production for British release. With the unlimited resources placed at the disposal of Mr. Guy Wedick, of Calgary, appointed general manager, he was able to deliver one of the most interesting and artistic photographic productions which has come out of Canada in some years.

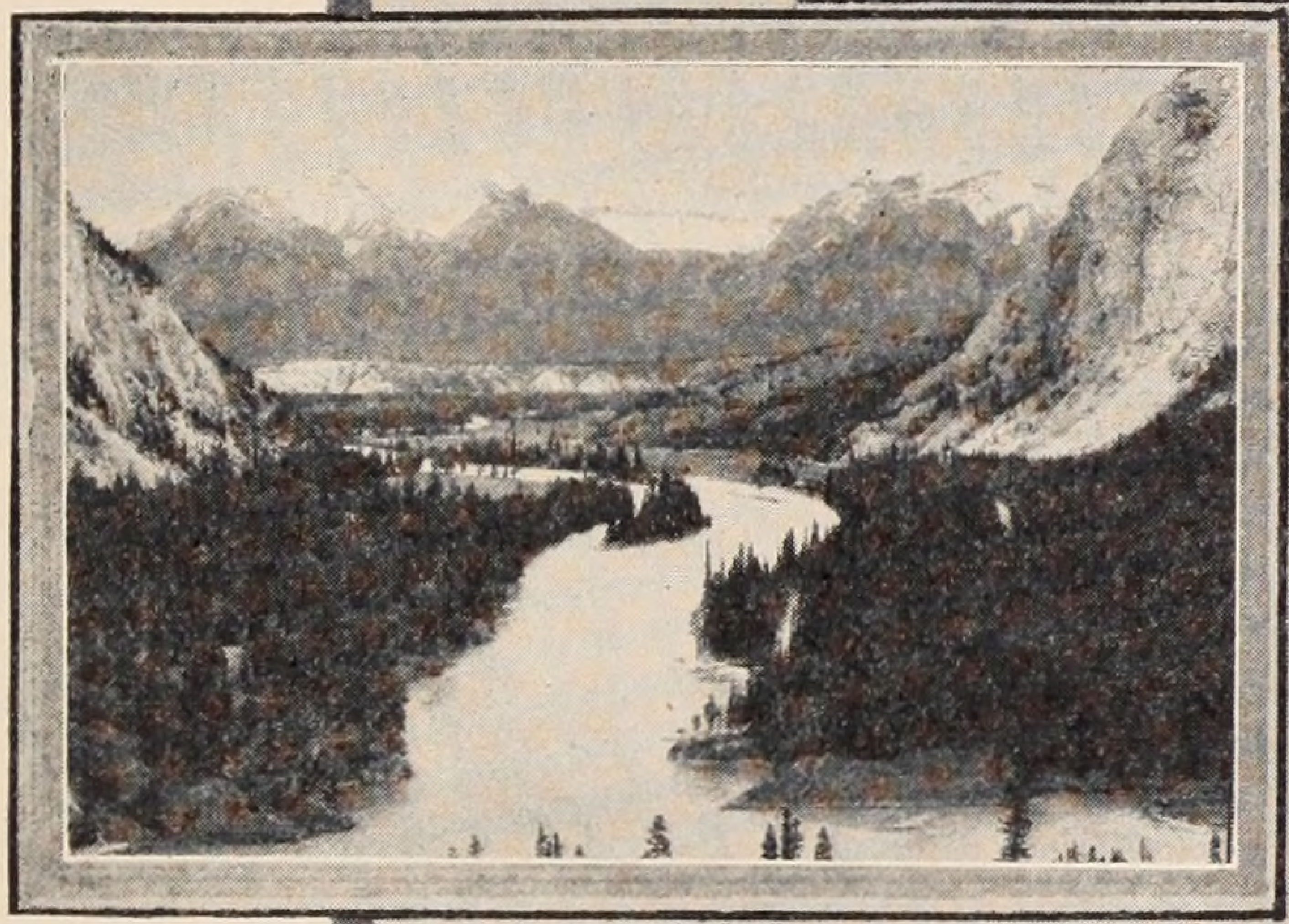
The cast of the acting company was made up of carefully chosen artists, among them, as leading lady, was Miss Barbara Kent, a little lady of wide popularity and a most pleasing personality. The company was organized in Hollywood with an entire cast of British born subjects, there being a stipulation in the arrangements that seventy-five per cent of the people employed must be British born. The company left Los Angeles May 14th and returned the last week of July following. During the making of the production the company travelled over the greater part of the southern territory of Alberta and British Columbia, transportation being furnished by the Canadian Pacific Railway whenever it was possible to use rail connections. Most of the traveling was carried on by automobile and pack horses.

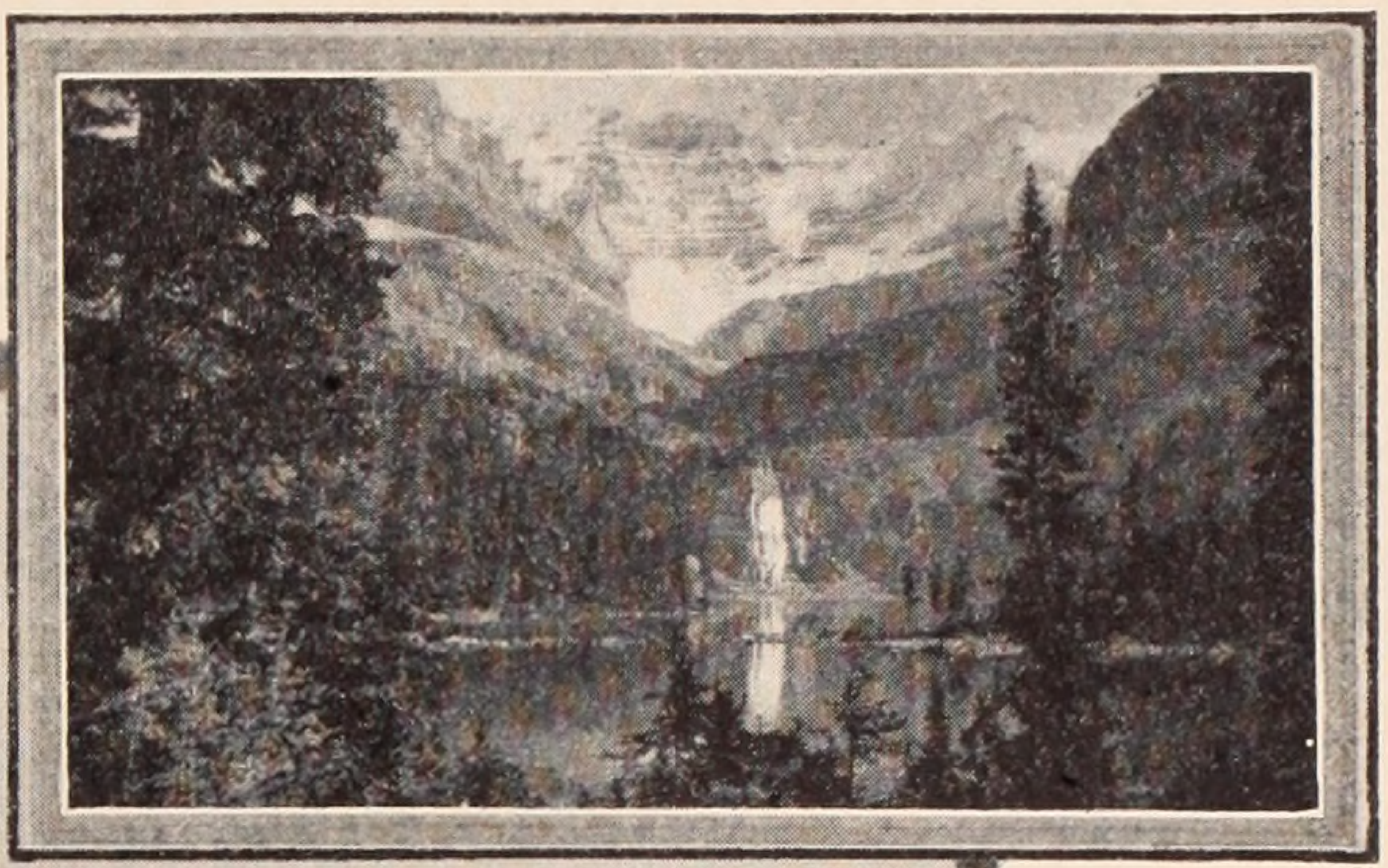
The influential people of these provinces vied with each other in their endeavors to contribute whatever assistance they could command that would add to the success of the enterprise and it was due to this action on their part that the management was enabled to overcome obstacles that would otherwise have minimized the splendid results achieved. The command of the Royal Northwest Mounted extended courtesies that were most pleasing, as did also the great Hudson Bay Company and the Government agencies in charge of Indian affairs aided in giving us contact with the Blackfoot tribe of Indians.

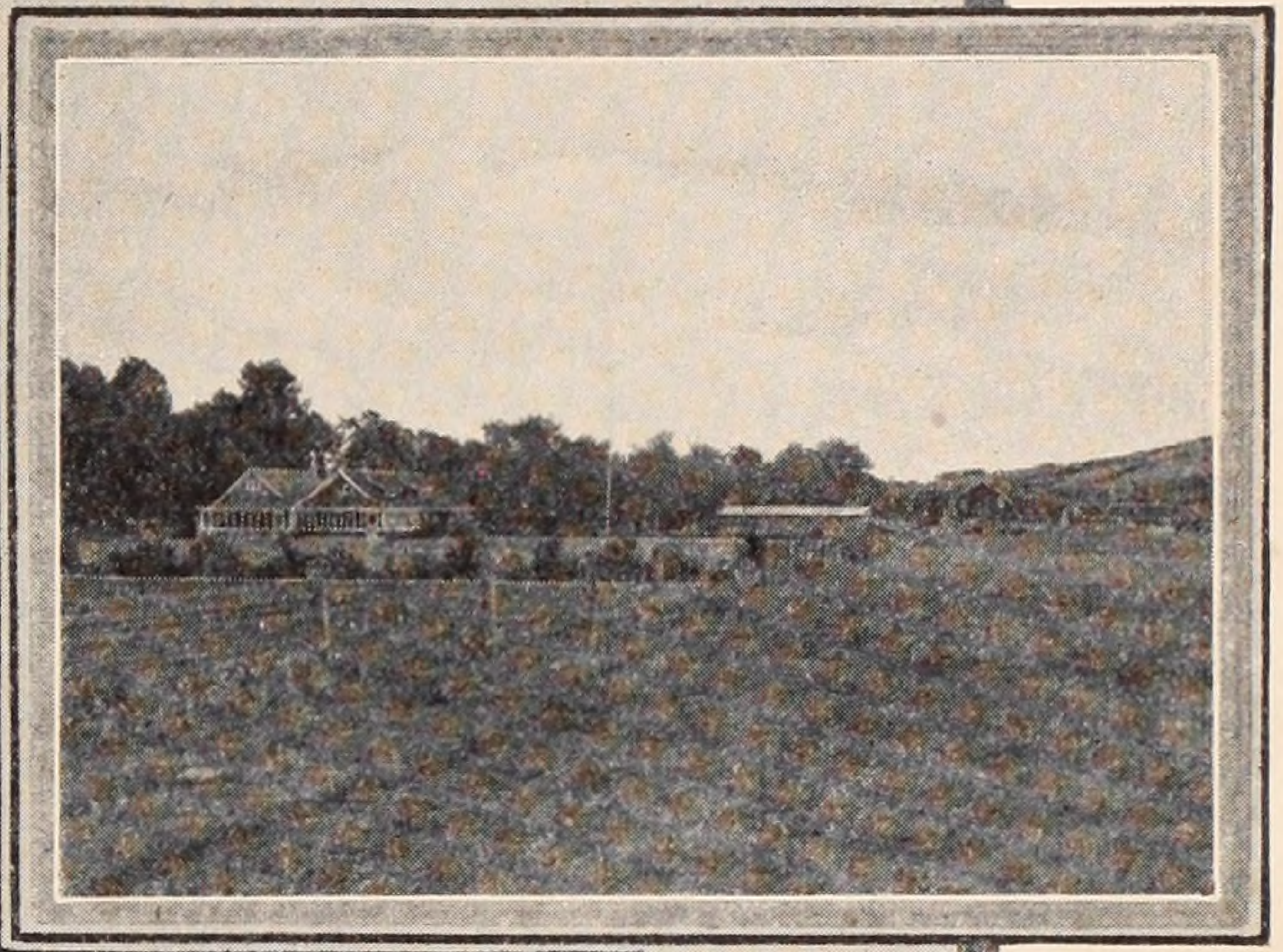
Delightful days afforded us excellent opportunities to include beautiful scenes on the immense ranch owned and controlled by H.R.H. the Prince of Wales, and we were permitted to use specimens of his blooded stock. From an eminence commanding a view of the ranch buildings in the foreground backed by mountains thirty miles distant and ever changing cloud formations, we were able to record scenes seldom surpassed for artistic beauty.

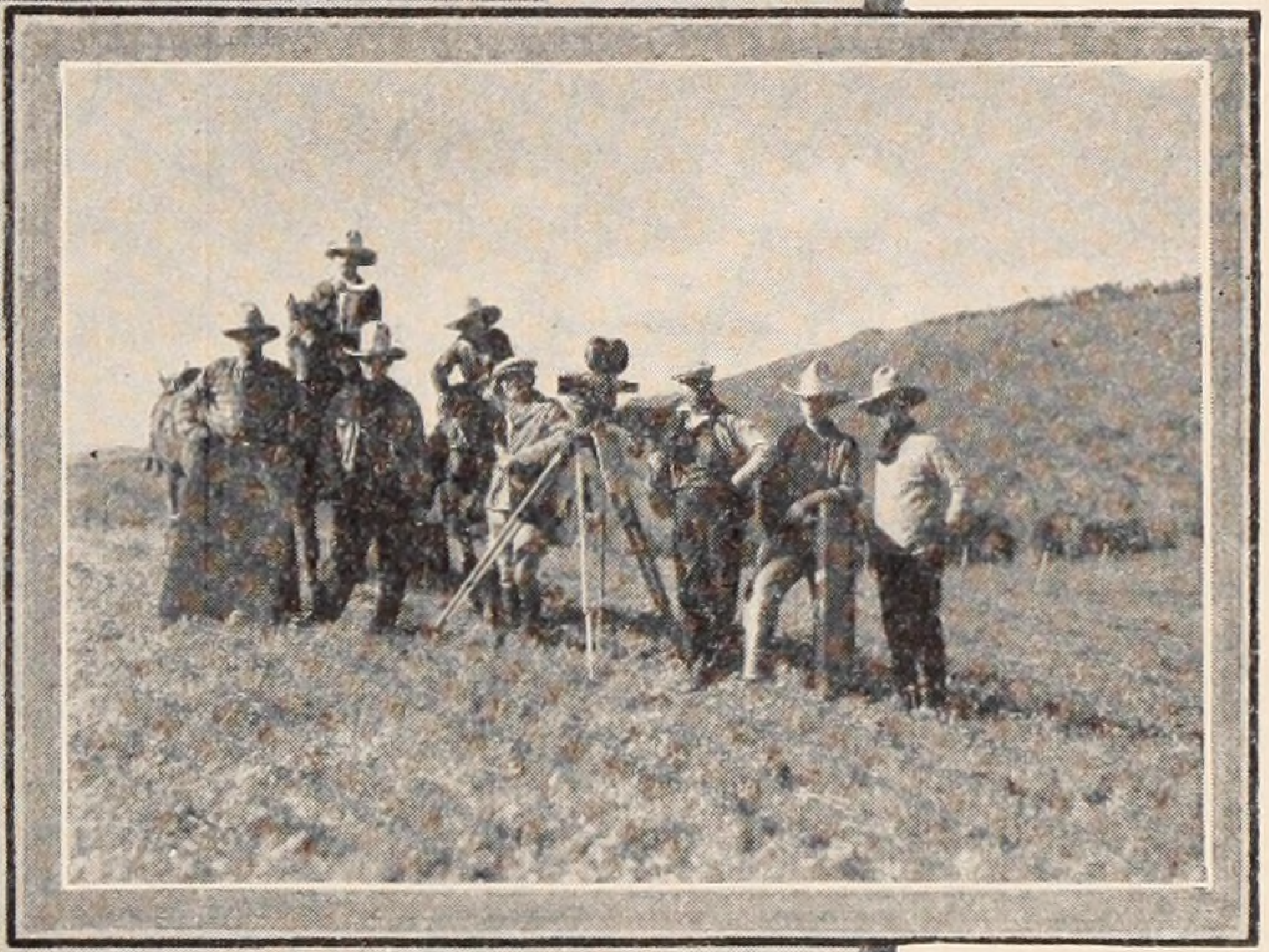
The equipment used in photographing this production was the latest improved Mitchell Camera complete with all accessories including a full line of filters for correction in use with panchromatic emulsions of the Eastman laboratories; Astro lenses ranging from 25mm to 12 inch were mounted for the camera; one 8x10 view camera, one 5x7 Graphic, one DeVry automatic and one late model Debrie.

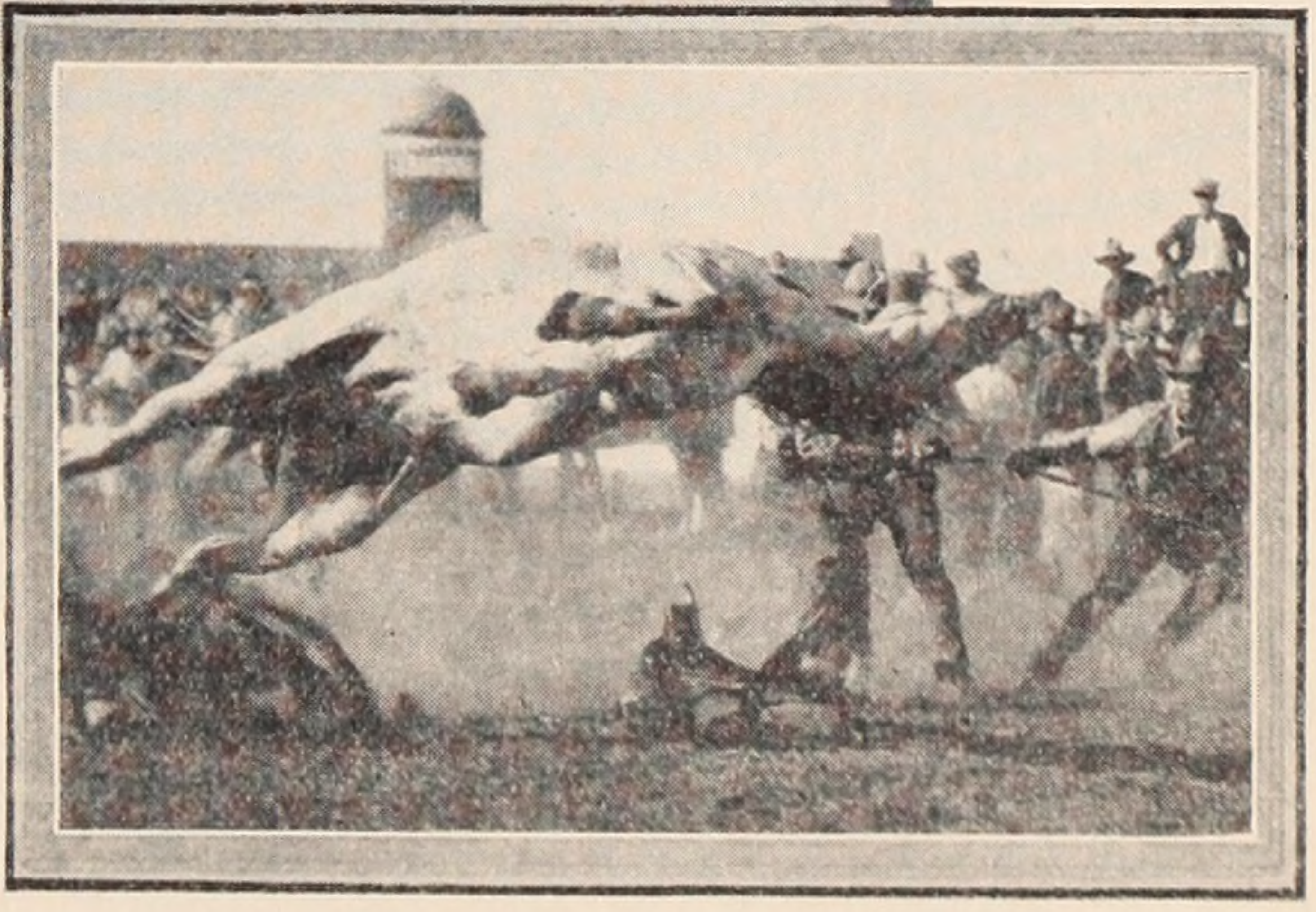












John Hill

Top to bottom, left: Breaking a wild horse; Alvin Wyckoff filming a stampede of wild horses, there are 8,000 to 10,000 in this drove; A good idea of the country; Packing Camera equipment. Top to bottom, right: One of the gorgeous bits of scenery; The Prince of Wales' own ranch; Chief Wyckoff and his gang; Throwing a wild horse.

We Wish Our Friends

The Cinematographers

A Very Merry Christmas
and
A Happy New Year

MOLE-RICHARDSON, INC.
STUDIO ELECTRICAL EQUIPMENT
941 N. Sycamore Hollywood, California

Shooting Sound in England

By Charles J. Davis, *A. S. C.*

Many articles on sound pictures have appeared in print of late, written by acoustic and sound engineers on the subject of recording. As the eye of the public has been trained to artistic photography, companies must not make the mistake that sound is everything. Both works of art must be united to make talking pictures a success.

In this new field, we add to the technical staff the very important sound man, who by working hand in hand with the cinematographer, can place before the public an interesting entertainment. Since incandescent lighting is being installed in sound studios, many worries of the expert who balances the voice of the artist have been eliminated and the improvement made in silencing the camera is another achievement.

In the Warner Bros. studios, Brooklyn, New York, three years ago where I was first engaged in experimental work on sound pictures, our cameras were set up in what we called a "padded cell." This was a sound-proof booth and, after making a ten-minute number, we would stagger out into the open as if coming from the hot room of a turkish bath. Then to our dismay the sound man would cry: "Too much camera noise, and lights 15 and 18 were noisy."

For the past eight months I have been assigned to London, England by the Fox-Case Movietone Corporation and can safely say that my sound man, Mr. Ralph Bitner, and myself, have made history in England by being the first to photograph and record on the same strip of film for the world at large to see and hear such notabilities as His Majesty King George V and His Royal Highness the Prince of Wales; Mr. Lloyd George, one of England's most prominent statesmen and Sir Arthur Conan Doyle, the noted spiritualist.

Of course, sitting in a luxurious theatre seeing and hearing His Majesty King George of England talk to the people of Newcastle-on-Tyne at the opening of the new cantilever bridge, no one could realize the difficulties of taking this subject. We arrived on location on Tuesday morning and commenced preparing our recording apparatus.

In the first picture, the place where the King was to stand was too far back under a canopy for good photography and it is difficult to imagine how many officials had to be interviewed before consent could be given to make any changes in the location from where the address was to be delivered. Then the microphone question had to be decided upon. It was found necessary to run 500 feet of cable from where the recording equipment was located, to the microphone. This sounds easy, but it was impossible to put the wiring overhead owing to two high tension tram-car wires, therefore, the microphone line had to be strung under the bridge from one side to the other.

It was just one hundred feet to the river below. I hated to see my buddie, Bitner, go over the side and crawl along the girders under the bridge. One slip and it would have been the end of a perfectly good sound man. In due course of time things were hooked up, but to make things worse it began to pour rain and wet everything. However, on the first test the apparatus worked to perfection. The following morning when the event took place the weather had cleared and for the first time the voice and picture of the King of England were recorded simultaneously.

Our interview with Mr. Bernard Shaw at his estate was very pleasant. He was quite inquisitive about our equipment and its workings. We were more than pleased when he decided to talk for us. Being a great wit his speech was very amusing. Before returning to London Mr. Shaw

Byrd's Farewell

Al Gilks, A. S. C. and Com. Richard Byrd, at Paramount's Long Island studio, at the finsh of a sound film of Byrd's career, on the day of his departure for the Antarctic.

requested that we join him at tea, which is a good old English custom.

On arriving at Mr. Lloyd George's estate our equipment was loaded into a trailer and a good old horse was used to pull it through some very soft ground to a location where Mr. Lloyd George talked on the cultivation of area lands on his estate which are now fine orchards. On returning to his home we were introduced to Dame Margaret and Miss Megan Lloyd George, all of whom spoke before the Movietone camera. On completion of these numbers a delightful luncheon was served. Mr. Lloyd George remarked that in case of a siege he would be able to supply the table with everything from his own farm.

On the following day a very noted character was to talk for Movietone and on arriving at the palatial home of Sir Arthur Conan Doyle, we secured a very interesting talk on "Spiritualism," which I am sure will be of great interest to everyone.

These are just a few of the interesting people we have photographed in sight and sound while in England.

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Shoot color with panchromatic light

WHEN the scene is colorful, shoot it with the light from National Panchromatic Carbons, using panchromatic film. These carbons produce light that is matched accurately to the film, and the result is correct tonal reproduction of the various colors.

National Panchromatic Carbons offer the additional important advantage of economy. They provide more photographic light per watt of electrical power than any other light source, except only National White Flame Photographic Carbons, and more visible light per watt than any other light source.

Both National White Flame and Panchromatic Carbons are interchangeable in your present arc lamp equipment

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The Filmoscope

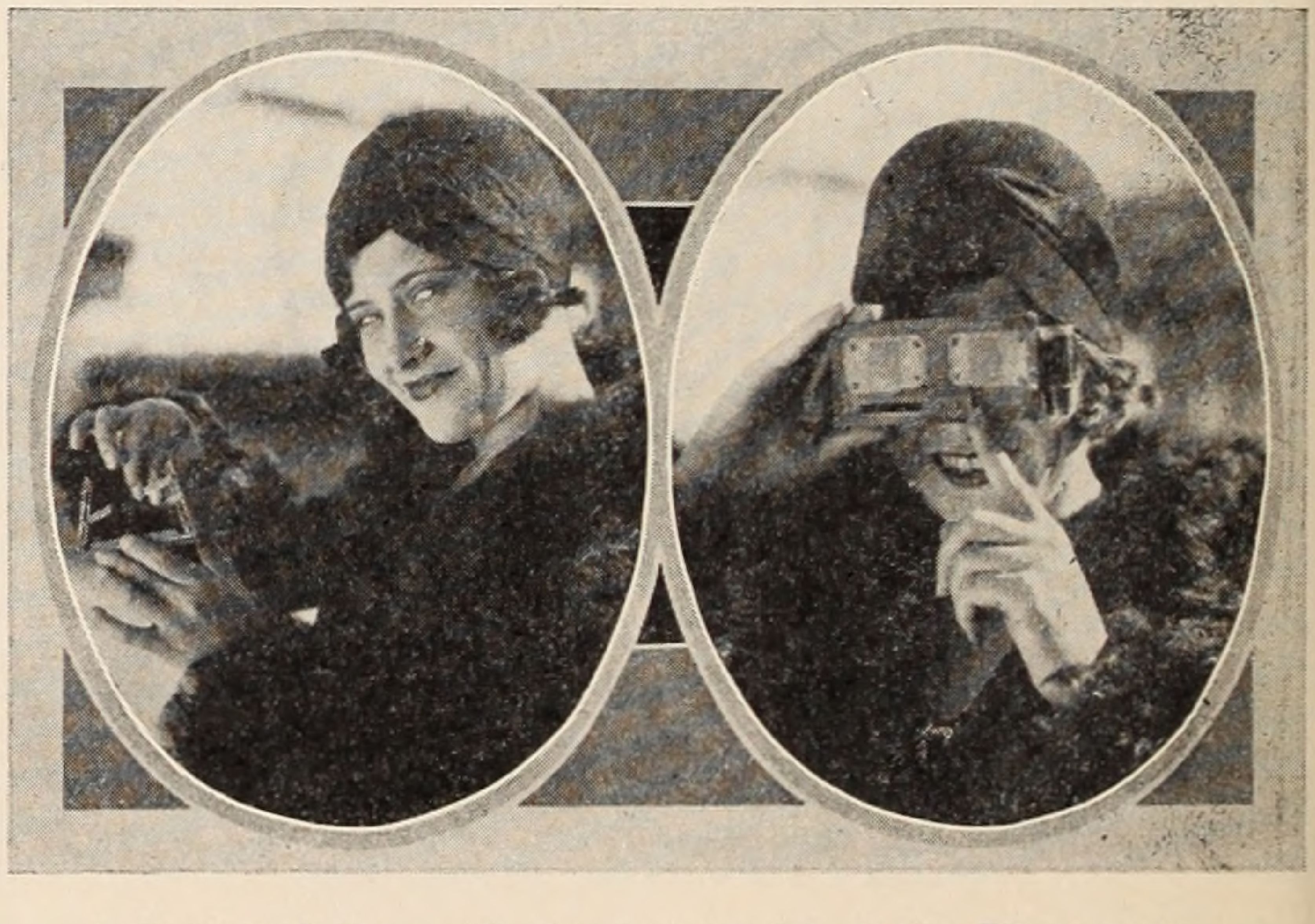
This is the name given by Mr. Andre Bartlatier, an A. S. C. member, to a clever little contrivance of his creation which, although not a motion picture appartus, seems to be destined to interest motion picture folk.

Mr. Andre Barlatier, A.S.C.

It is a stereoscope designed to view pairs of stereoscopic pictures printed upon motion picture film. Mr. Barlatier has adapted to the Filmoscope, which is so compact that when folded one can carry it in his vest pocket, a very ingenious system of carrying pins which, engaging in the film perforation, permit the change from one view to another by the simple pressure of one finger, thus avoiding the inconvenience and loss of time and bother involved in changing the views as in other similar apparatus.

The series of pictures are so distributed over the film that, although keeping the proper distance between each pair of stereoscopic pictures, the views are alternately printed in close succession so that all of the film surface is made use of. This permits the printing of 24 stereoscopic pairs of views in about three feet of film, the number of pictures being limited only by the length of the film used.

It has always been claimed, and all fans well know, that stereoscopy affords the most fascinating and, perhaps, logical, mode of photographic reproduction, which is not more popular because of the somewhat cumbersome apparatus essential to this method.



A Universal Star with the first model of the Filmoscope—Note what a handy little affair it is.

Mr. Barlatier has eliminated all cumbersomeness and the lightness and ease of operation of the apparatus makes one appreciate still more the realization of depth

The Captain of the Crew

At a meeting of the Technical Division of The Academy of Motion Picture Arts and Sciences recently, J. A. Ball, Director Technical Bureau M.P.P.A., in an informal talk made the following statements which are of interest to every cameraman. The quotation is verbatim and is published with the permission of Mr. Ball:

"A motion picture director in lining up a scene has a dramatic effect to get over. He must rely on his technical crew to handle the scene technically so that the dramatic effect does 'get over,' not only to the director's eye, but to the camera as well.

"In the past, photographic requirements have been the controlling factor so that the cameraman may be said to have been the captain of the technical crew.

"Now with the arrival of sound, the effect must get over not only to the camera but to the microphone as well. In this new set-up, who is to be captain of the crew?

"At present there seems to be a tendency to stress the problems of the microphone and ignore those of the camera. If this is so it is only because the microphone is the new arrival. I believe eventually the two must receive equal consideration and then the captain of the crew will be the man who knows both instruments. In the endeavors to attain this position I believe the cinematographer has a better chance than the radio broadcast man who enters the industry as a microphone expert. The latter will have to overcome a desire to have the actors "broadcast from the screen"—he will know nothing about the dramatic effects nor the pyschology of actors and directors, nor is very much yet known about the 'art' of placing and handling the microphone.

"So I say the cinematographer will find himself in a favorable position to advance himself provided only that he is progressive, adaptable and a student."

Our Cover for December

The beautiful picture which adorns the front cover page of THE AMERICAN CINEMATOGRAPHER for December, is a reproduction from the work of an unknown camera artist whose name we regret cannot be blazoned upon his handiwork. The locale of this picture is evidently in the great Northwest, probably in Washington, where brown bears are still very much at home. The picture has a delightful atmosphere of Yuletide about it and if any other magazine in the industry can show a cover as thoroughly charming and appropriate, THE AMERICAN CINEMATOGRAPHER will bow to it. Until that time we claim the championship of the world.

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or third dimension which is so lacking in usual still photography.

Mr. Barlatier has organized the Filmoscope Company of America, which will not only distribute the Filmoscope but also prepare and edit series of films, which, sold at a nominal price, will undoubtedly soon find room in every home, office, laboratory and what not.

The first series will include series of stereoscopic pictures of motion picture stars.

Can you imagine the delight of the fan, getting for practically the same cost, twenty-four pictures instead of one of his favorite star, and to see that star with the added attraction of the third dimension with all the vividness of almost real life.

Mr. Barlatier is busily arranging series of these film strips, which he calls "Filmograms," covering subjects of interest to all—scenic, industrial and scientific pictures—which illustrate fields of action in every walk of life, and will have their particular educational or commercial purpose. The compactness of the apparatus, which, when folded, measures 5x2½x½ inches, its attractiveness and its extremely low cost, will undoubtedly make it very popular and we feel in duty bound to congratulate our member for having found time in addition to his numerous motion picture activities, to produce a refreshing novelty which will amuse, instruct and be useful in many ways.

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Months of exhaustive testing has proved Panchromatic Make-Up to be a great success.

Panchromatic Make-Up is an important step towards the standardization of make-ups. It will relieve the Cinematographer of a great burden.

Studios and Cinematographers are requesting all subjects to use Panchromatic Make-Up. They have tested it thoroughly and have found it a safe and sure way of insuring results.

Panchromatic Make-Up is a Max Factor development. It owes its inception to the Incandescent Tests at Warner Bros. Studios.

Panchromatic Make-Up is worthy of the attention of every A.S.C. Member. We urge you to use it.

* * *

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General Principles of Sound Recording

By E. C. Wente

Bell Telephone Laboratories, Inc.,
New York, N. Y.

That sound as perceived by the ear is the result of a disturbance in the air was known to the ancient Greeks, and that objects are set in vibration by intense sounds must have been observed by primitive man, but it was not until 1857, or less than a century ago that the first instrument was constructed for making a graphical record of sound waves. In that year Leon Scott patented in France an instrument which he called the phonautograph. In Fig. 1 is shown a picture of this instrument. A piece of smoked paper was attached to the cylindrical surface of a drum, which could be rotated by hand and moved forward by a screw. The center of a diaphragm was attached to a stylus through a system of levers in such a manner that the stylus was moved laterally along the surface of the cylinder when the diaphragm vibrated. Over the diaphragm was placed a barrel-shaped mouthpiece. When the drum was rotated, words spoken into the mouthpiece caused the stylus to trace a wavy line upon the smoked paper. This wavy line was the first known record of sound vibrations.

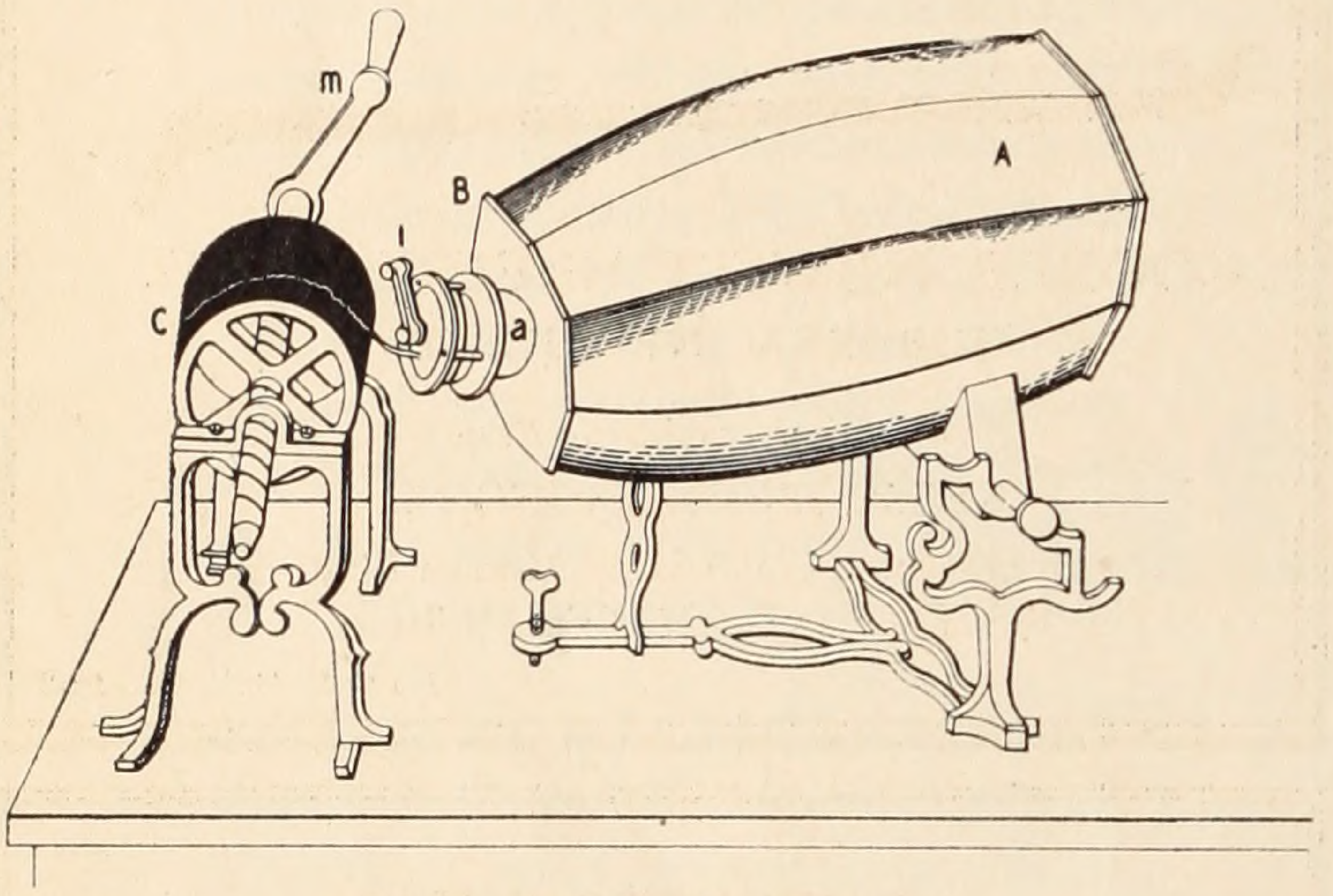

FIG. 1 Scott's Phonautograph

It was twenty years later in 1877, that Edison brought out an epoch-making invention. Edison constructed a machine very similar to the phonautograph but differing in two important details. The smoked paper was replaced by a sheet of tinfoil and stylus was attached directly to the diaphragm, so that it traced an impression of variable depth when the diaphragm vibrated, instead of a wavy line as in the case of the phonautograph. After such a record had been made the drum was set to the starting point and with the stylus in place was again rotated at the same speed as before. The recorded sound was then intelligibly reproduced. Thus Edison gave us the first phonograph.

In subsequent models the tinfoil was replaced by a wax cylinder. For many years the wax record, either in cylinder or disc form, was used almost exclusively for the recording and reproducing of sound. Although many other methods of recording have been suggested, it is only in the last few years that records made photographically have come into the commercial field as competitors. Both the wax and the photographic records are now being used in conjunction with motion pictures.

Photographic records are now being made by many different types of apparatus. But they may be divided into two general classes. In one of these classes the record is a trace of constant photographic density but of variable width, while in the other it is a trace of constant width but of variable density. An illustration of each of these is shown in Fig. 2. In one or two proposed methods the record is a combination of both types.

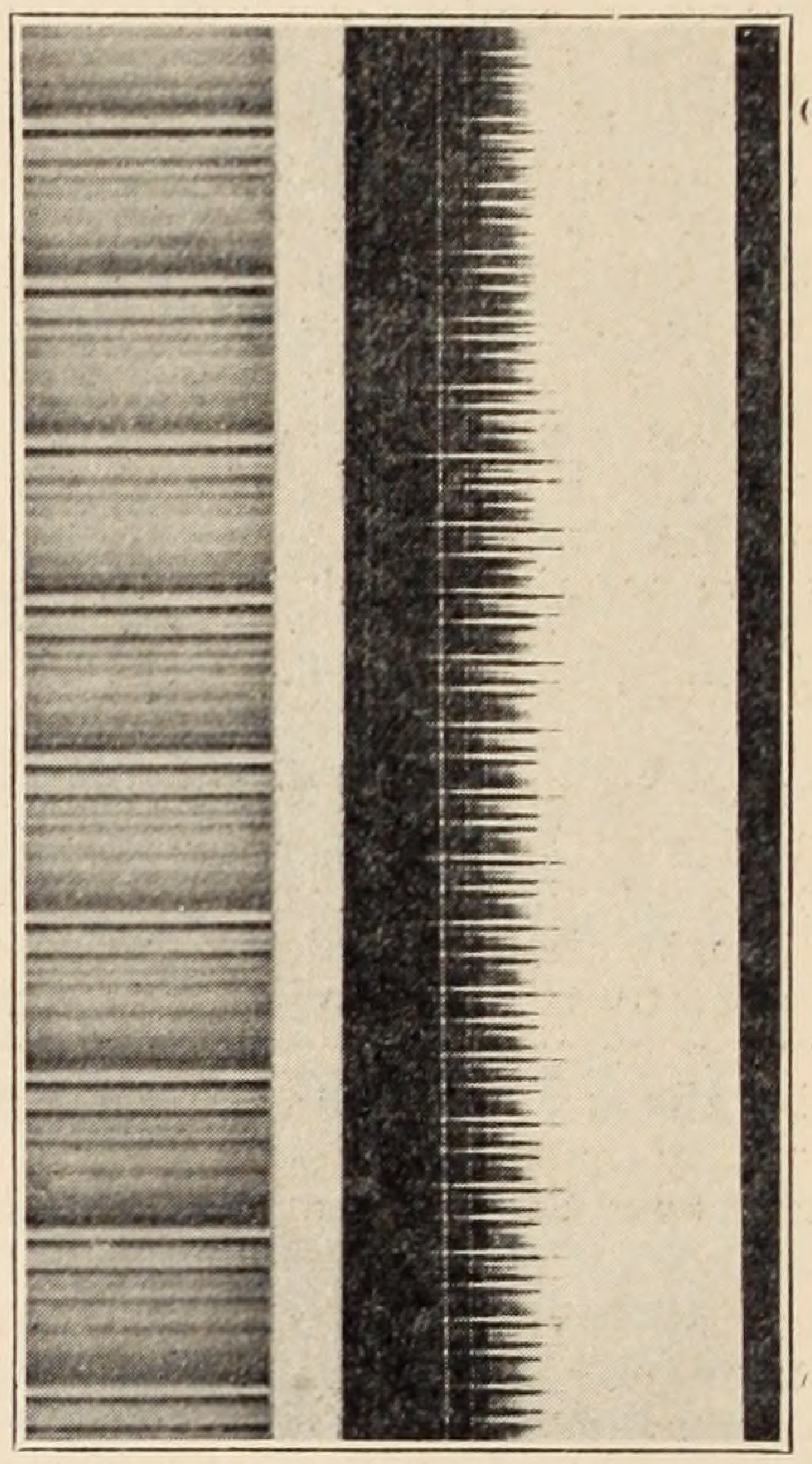

FIG. 2. Types of Photographic Sound Records.

In almost all systems experimented with today there is at least one element in common with the phonautograph, viz.: a diaphragm which is set in vibration by the sound to be recorded. As in the phonautograph, the diaphragm may be mechanically connected to the engraving mechanism or recorded; or, again, it may be connected electrically as in most modern systems. But in practically all of them the diaphragm forms an essential element.

Unfortunately a diaphragm does not in general have the same response at all frequencies. A favorite experiment in lectures on elementary physics is to sound a tuning fork and with it, through the air, set in vibration a second tuning fork. In this experiment it is important that the pitch, or the resonant frequency, of the two forks be very nearly the same, otherwise the motion set up in the second fork will be too small to be observable. Diaphragms, and in fact almost any other type of mechanical system, will have at least one resonant frequency, which means that, under the action of sound waves, the response will in general be much greater in this region than at other frequencies.

In the older methods of recording resonance was purposely introduced in order to obtain records of sufficient amplitude. The frequencies lying in the resonance region were then much overemphasized. The sound reproduced from such records and a blasting and metallic quality, and well deserved the title "canned music."

Because of the complex nature of speech and music and of the great amount of distortion introduced into the early recorders and reproducers, it is not surprising that the quality of reproduction was poor, but it is really astonishing that the reproduced sounds were at all intel-

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This article was originally presented at the Fall convention of the Society of Motion Picture Engineers held at Lake Placid, N. Y., September 24-28, 1928.

ligible. In fact, it has been suggested that, had the complex nature of speech sounds been generally known at the time, the invention of the telephone, which preceded the phonograph, might have been delayed for many years since its inventor probably would have dismissed his ideas as altogether impracticable.

Although considerable distortion may permissibly be introduced by the recording and reproducing systems before the character of the sounds is so changed that they can no longer be recognized, it is equally true that, if all classes of sounds are to be reproduced to a degree of fidelity where the ear cannot distinguish them from the original, the amount of distortion must be kept extremely small. It is therefore necessary to diminish the distortion by the diaphragm to a negligible value.

Primarily that a diaphragm giving a uniform response may be used and that a record of sufficient amplitude may still be obtained, the electrical method of recording has been developed which is today widely used in the production of commercial sound records. In this method the pick-up diaphragm is made a component part of the recording microphone. Here we can content ourselves with a small amplitude of motion and amplify the voltage generated to an amount sufficient for operating a rugged and distortionless recorder. It may be of interest here to compare the amplitude of motion of the diaphragm in the Edison recorder with that of the microphone used in the majority of present recording systems. In the former the maximum amplitude required for the loudest sounds is about 0.001 inch, whereas in the latter under ordinary recording conditions it is only about one-tenth as great and the weight is only one-twentieth as great. It can thus be seen how the problem of design of a pick-up diaphragm is greatly simplified in the electrical method.

It is, of course, important that the rest of the recording system shall also be free from distortion. However, if a microphone of uniform response is available, the design of a distortionless recorder is made comparatively easy, for its sensitivity may to a large extent be disregarded, inasmuch as the required power can in general be obtained by the use of vacuum tube amplifiers.

In the electrical method, extraordinary improvements have been made over the older systems in the elimination of distortion.

The problem of developing recording apparatus is in many respects identical with that of developing a high quality radio transmitter. In the former, however, there is the additional problem of distortion introduced by the record itself. If, for instance, a record is run at a speed of ten inches per second, and a tone having a frequency of 5000 cycles per second is recorded, the length of one cycle on the record will cover a distance of only 0.002 inch. In the case of wax records the needle must have a very fine point; and in the photographic record the width of the light beam as measured along the direction of motion of the film must be extremely small. At whatever speed the record may be driven, there will always be some frequency beyond which all tones will become more and more attenuated. While the loss of the higher frequencies does not in general impair the tone quality to the same extent as does the presence of sharp resonance regions, yet it reduces the intelligibility of speech and the richness and brilliancy of musical sounds.

There is another type of distortion commonly present in reproduced sound, which is frequently designated as non-linear distortion. This type of distortion is introduced when the excursion of any element of the system is not proportional to the stimulus. For example, a pure tone, which is of sine wave form, such as is shown in Fig. 3, a, may be reproduced so as to have a wave form similar to that shown in b. Physically, distortion of the wave form in this manner is equivalent to the introduction of extraneous frequencies. If the magnitude of these extraneous frequencies is too great, the tone quality will be very disagreeable. However, a small amount of distortion of this kind is not noticeable, for the reason that the primary will mask the extraneous tone. It is a well known fact that a tone must be much more intense to be heard if another tone is sounded simultaneously.

Another type of distortion peculiar to recording is that introduced by a non-uniform speed of the medium

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METEOR
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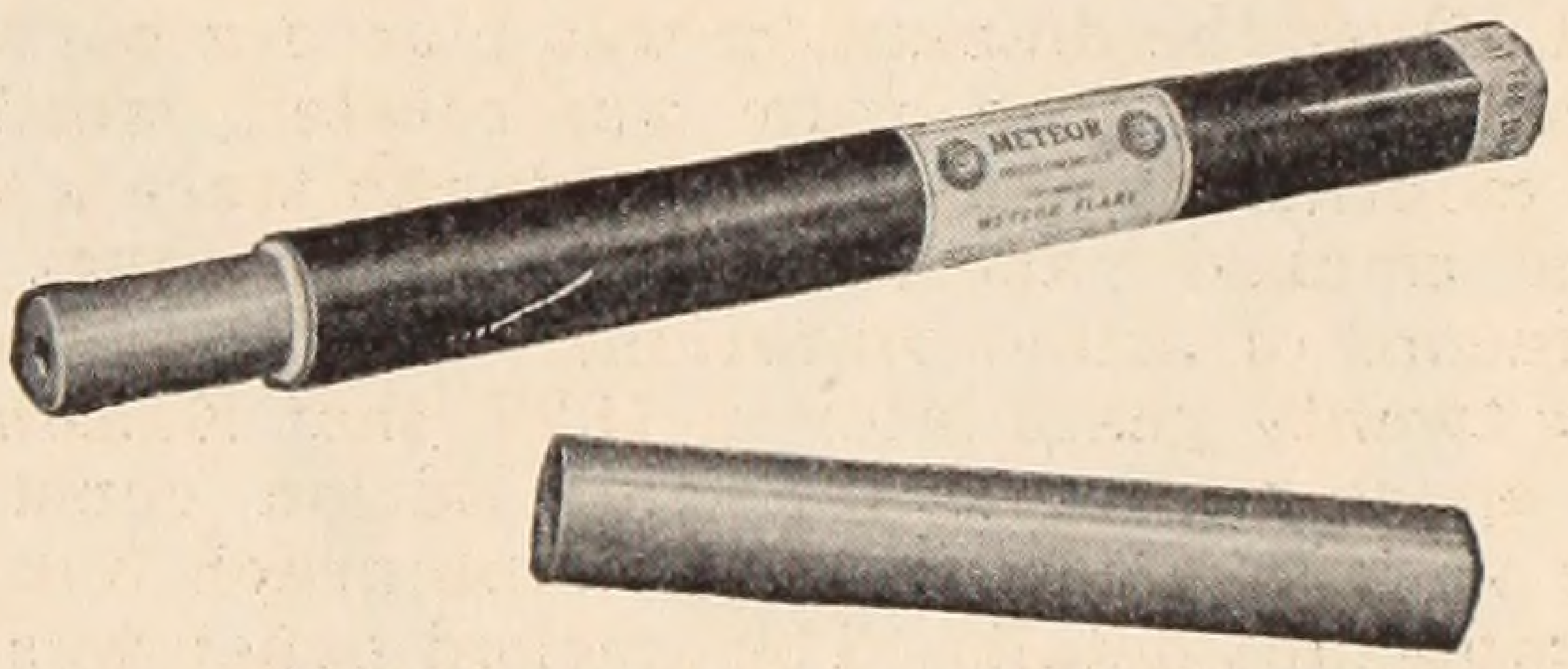

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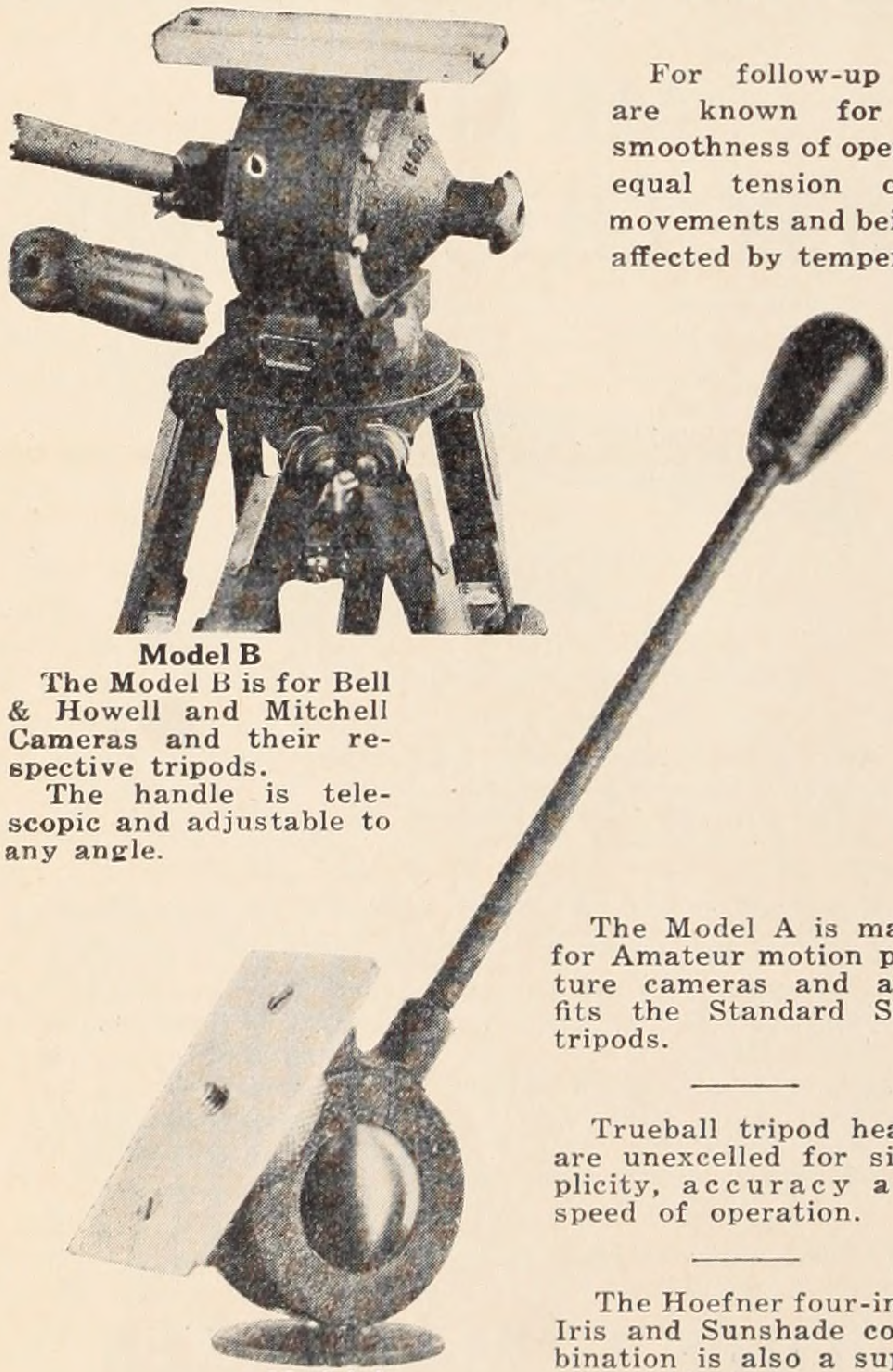

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on which the record is engraved. This may not always be serious, but, in certain cases of sustained tones, speed variations cause a disagreeable flutter and in some types of music a decided harshness of tone.

One of the most serious problems with which the radio engineer has to contend is static interference. This also has its counterpart in sound reproduction from records. As the ether through which the radio waves are sent is non-homogeneous because of extraneous electrical disturbances, so the sound record is non-homogeneous on account of the non-uniformity of the material on which it is engraved. The noise resulting from these irregularities is often designated as surface noise. In the case of the wax record, an appreciable part of this noise has its origin in the minute irregularities of the material and, in the case of the photographic record, in the finite size of the grains forming the photographic image. The difficulties of eliminating this noise arise from the fact that the physical intensity of audible sounds covers an exceedingly wide range. Fig. 4 shows curves published by Wegel * on the sensitivity of the ear. The lower curve gives the threshold of audibility and the upper

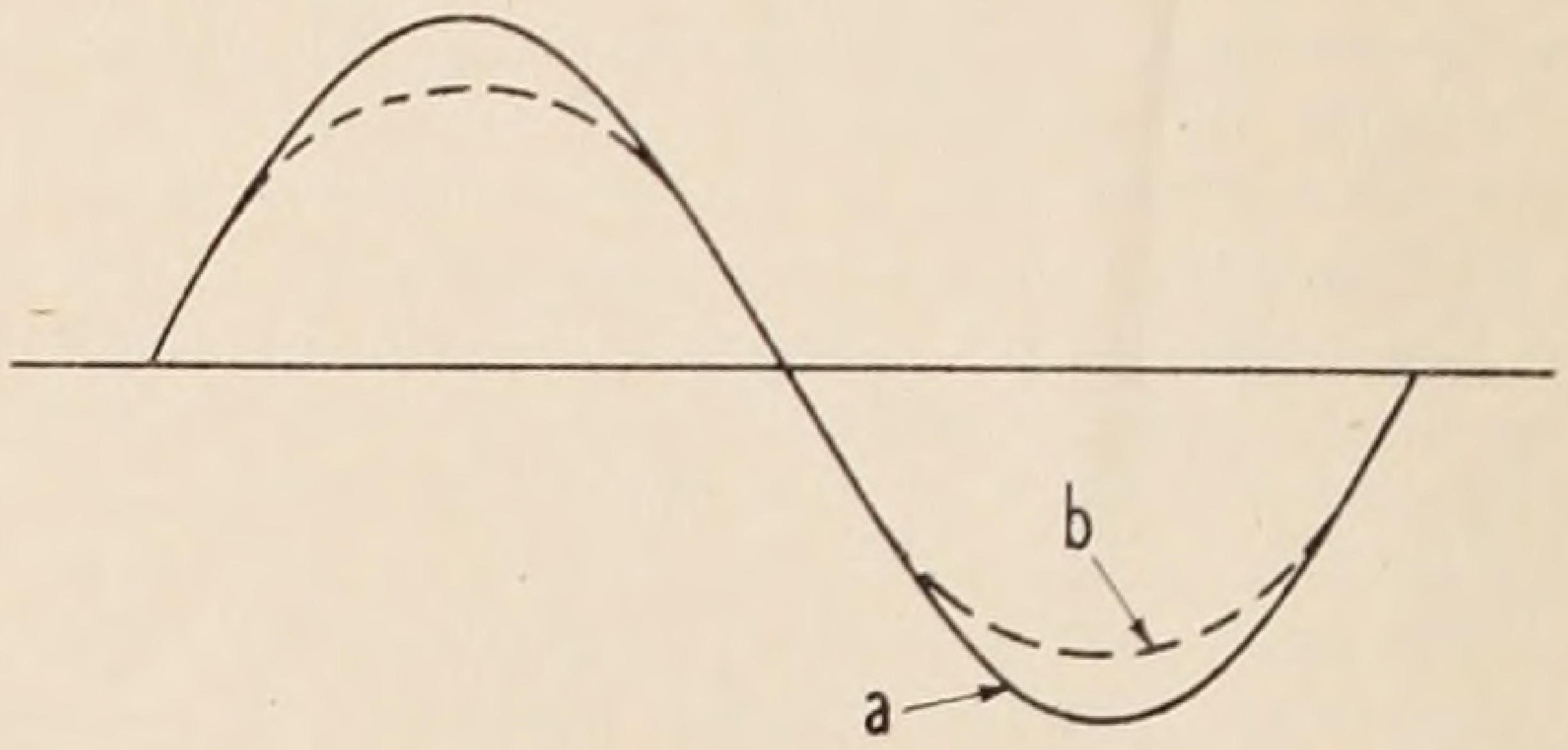

FIG-3 NON-LINEAR DISTORTION OF SINE WAVE

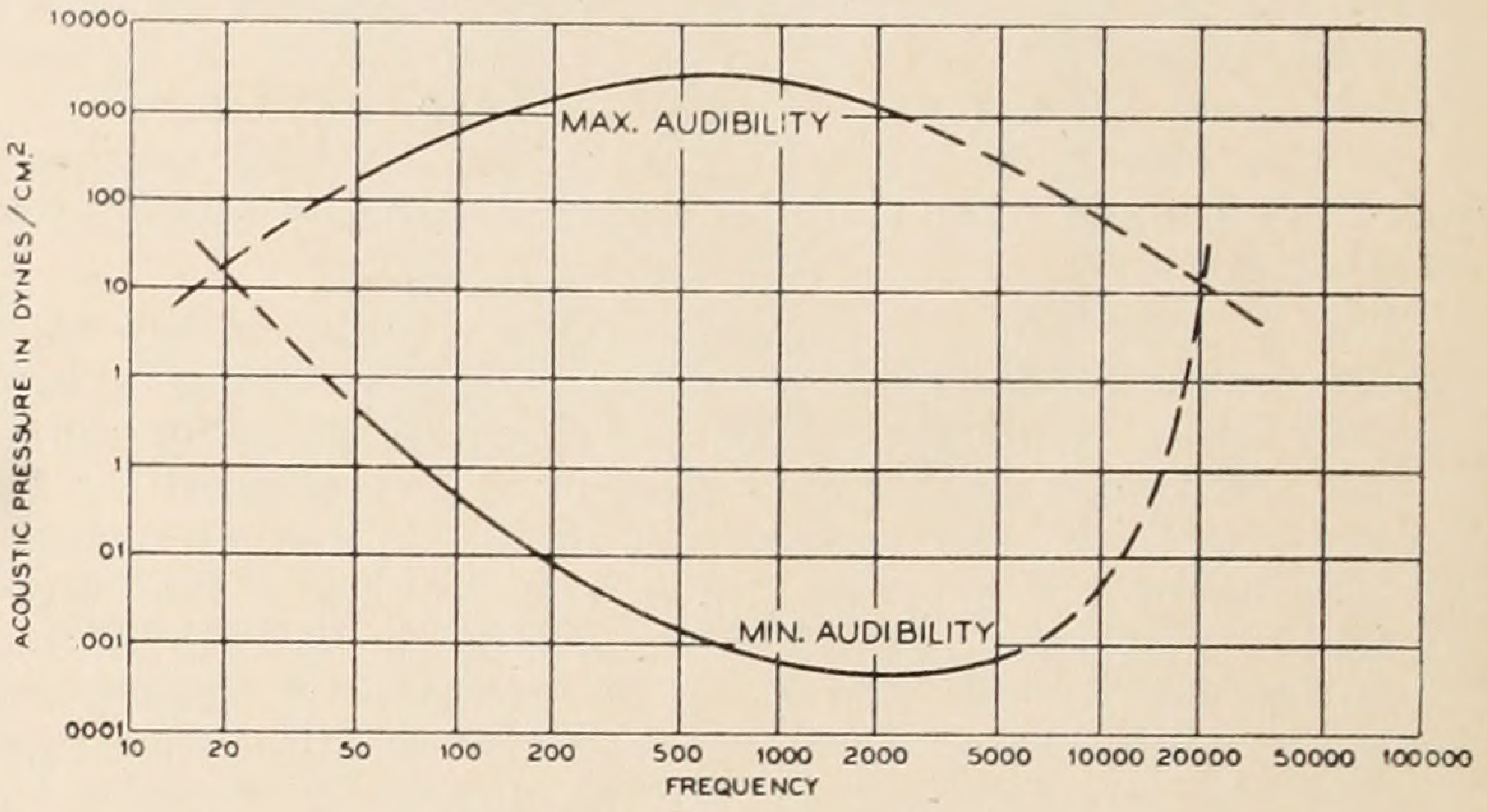

FIG.-4 SENSITIVITY OF THE EAR

curve the feeling level, i.e. the level of intensity of of volume were to be recorded the amplitude of the loud-sound which becomes painfully loud. The ratio of pres-is about ten million. If a record of this extreme range sures of the maximum to the minimum of these curves est tone would have to be ten million times as great as for the faintest tone. There is, in general, a maximum amplitude that a record can accommodate, which, for instance, in the case of the wax record is about 0.002 inch. If a tone having an intensity near the feeling level is recorded at this amplitude, then the amplitude of a tone just audible would be only 0.000,000,000,2 inch. It is difficult to get a material having a degree of homogensity corresponding to this value. A similar condition obtains in the case of photographic records, where the pattern is formed by grains in the emulsion which have a magnitude somewhat less than .001 mm., depending upon the type of emulsion used. The range of volume considered here is extreme. Practically it is not necessary to record a range of this extent, but it serves to illustrate the extraordinary requirements placed upon the recording medium. When the range of frequencies that are to be reproduced is increased, the surface noise effect becomes greater. As in the case of the different

Welcome Film Editors

On Wednesday evening, November 21, at the Hollywood Chamber of Commerce, approximately one hundred motion picture film editors assembled for the first regular meeting of an organization to be officially known as "Film Editors." It is intended that the association shall be a non-profit, mutual benefit group, and strenuous endeavors are outlined whereby every film editor in the industry will soon be enrolled.

For several months less than a dozen men have been working toward the formation of Film Editors. Their efforts were so surprisingly successful that the first regular meeting was about twice as large as originally expected. And it is a boast which will long be remembered in the annals of Film Editors that their first meeting was graced with the presence of almost every first-class film editor in the profession. There is certainty that the general idea has found wide response, all of which indicates that the new unit will be exceptionally strong in membership.

The first regular meeting was devoted mostly to election of fifteen governors, this body, in turn electing from their own number a chairman, three vice chairmen, secretary and treasurer.

The complete Board of Governors is composed of Edgar Adams, George Arthur, Hugh Bennett, Edward M. McDermott, Stuart Heisler, Hal Kern, Frank Lawrence, Irene Morra, George McGuire, Lloyd Nosler, Desmond O'Brien, Edward Schroeder, LeRoy Stone, Grant Whytock and James Wilkinson. The body immediately held an election whereby Stuart Heisler was made chairman, Frank Lawrence, Lloyd Nosler and George Arthur, vice chairmen; Edward McDermott, secretary; and LeRoy Stone, treasurer.

Regular meetings are planned the first Wednesday in each month, at 8 p. m. sharp, in the Hollywood Chamber of Commerce.

Motion Photomicrographs

Continued from Page 13

speed). The usual time of development was about one minute. When projected at normal speed, the scenes last about fifteen seconds.

In Fig. 2 are reproduced two sets of pictures showing the grains at the beginning and end of development. In these reproductions, the blackening of the grains and change in general appearance are pronounced. In the motion picture projected on the screen a number of other interesting phenomena can be seen. The development with Elon in most cases starts distinctly from centers on the grain. During development, the grain is in constant vibration as a whole. This movement, though it is very small (of the order of 0.00001 inch), is plainly visible in the magnified image on the screen. During development, the grain throws out thread-like protuberances which likewise are in rapid movement. It is the appearance of these streamers which has given rise to the idea that some grains explode upon development. Different developing agents show marked difference in the type of action. In general those of high reduction potential such as Elon show rather violent action and almost complete change in the exterior conformation of the grain. Developers of low potential such as hydroquinone, however, result in less change of the grain outline.

Further work using the same method to picture the deposition of silver sulfide sensitizing specks is in progress.

The writers wish to acknowledge the help of C. A. Morrison, of this laboratory, who assisted materially in developing the technique which has been described.

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types of distortion discussed above, the difficulties to be met are increased as the quality of reproduction is improved.

Bell Telephone Laboratories, Inc.,
New York, N. Y. September 17, 1928

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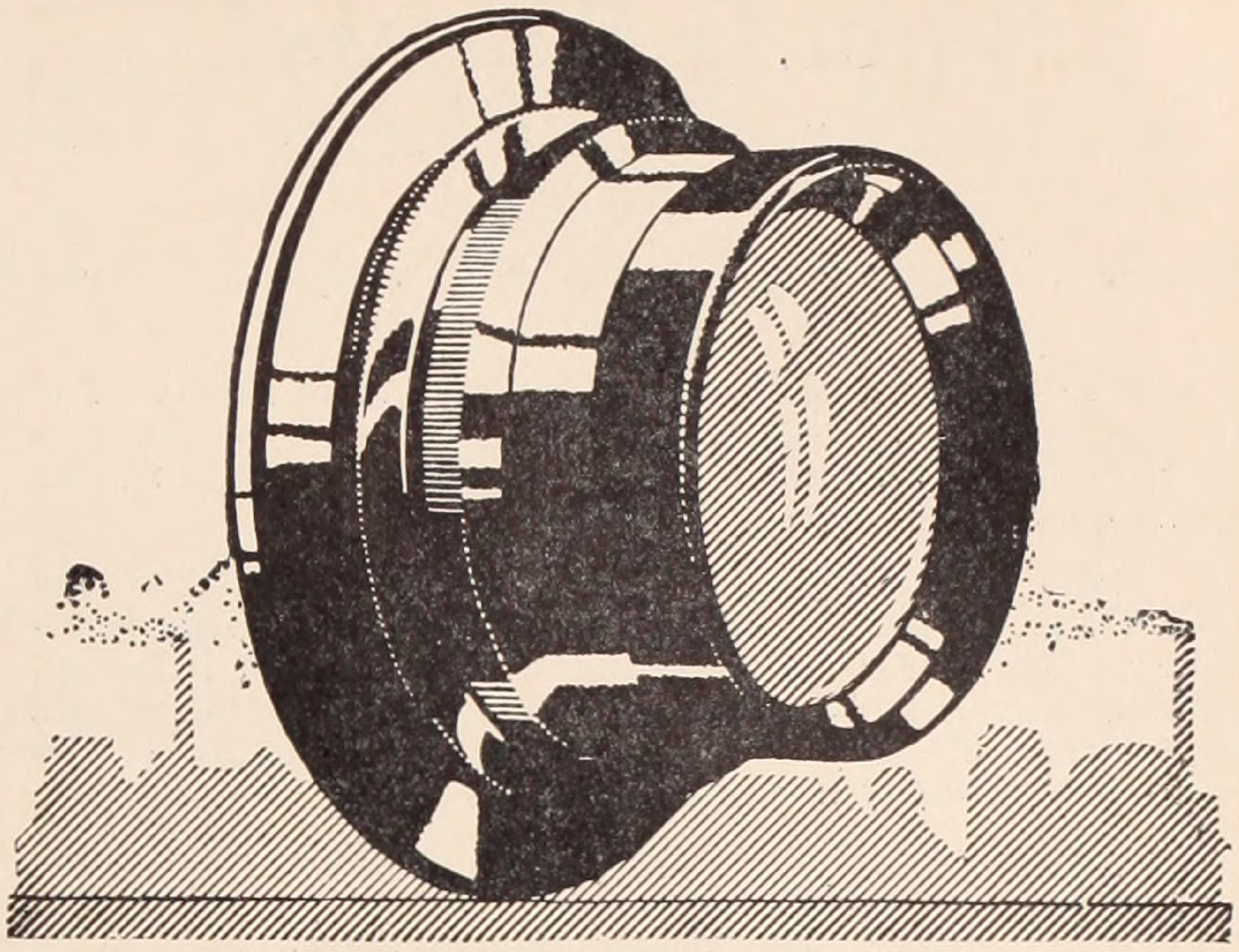
*The Physical Examination of Hearing and Binaural Aids for the Deaf—R. L. Wegel. Proceedings of the National Academy of Sciences, vol. 8, No. 7, July, 1922.



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What Is Success?

John F. Sinclair Tells How One Man Won It and What He Did With It.

(Copyright, 1928, in All Countries by North American Newspaper Alliance.)

Terry Ramsaye, brilliant biographer, once said that if "the whole of George Eastman's life were to be run through a white filter paper, there probably would not be a tint or trace of abandon or recklessness."

In an age of supreme adventure, with many of the greatest fortunes made by wild speculation, George Eastman of Rochester pursued the even tenor of his way, said little, held fast to his own rules, experimented within limits, worked hard and landed on top with one of the largest private fortunes in history.

"Let's see. Just how much, Mr. Eastman, are your benefactions to date?" asked an indiscreet but ambitious reporter recently of the kodak manufacturer.

No answer. Discreetly silent, pleasant, courteous, but still no answer. And there will be no answer, for George Eastman is not given to personal "tooting." Not, at least in the direct, positive, cards-all-on-the-table way. Most of his donations are anonymous.

Recently I read a private letter disclosing an Eastman contribution unknown to the public at large of $50,000 a year, for ten years. It was given toward a public endeavor of great merit, but not one that the public is accustomed to think of.

Some say George Eastman is the greatest anonymous philanthropist in America. And his known gifts by now must total close to $60,000,000.

George Eastman was born at Waterville, N. Y., on July 12, 1854. So he is now past 73 years of age. When George was six years old his parents moved to Rochester, where a year after his father died, comparatively poor. His mother was forced to work, opened a boarding house and kept George in school until he was 14.

By that time his mother could do no more. George went to work at $3.00 a week. He moved ahead, kept his eyes open, and in seven years he had saved $3000.00.

Often one's whole life is changed by a small happening. It was so in the case of George Eastman. When he was 24 he decided to take his first vacation, a trip to San Domingo. A friend suggested that he take a camera along. He purchased one, and gave one of the two camera photographers in Rochester $5.00 to teach him how to handle it.

Eastman found the camera was awkward, unsatisfactory and complex. He decided immediately to simplify it. That's the way his mind worked. He cancelled his trip to San Domingo, took a shorter one and gave all his time to his new interest.

He read everything he could find on the subject. That wasn't much. He fixed up a room in his mother's house and built his own ideas into camera equipment.

The dry plate came first. With his $3000.00 Mr. Eastman started business. He made a great supply of dry plates during the winter and then found them all spoiled. He saw his savings melt away. But he held out for dear life while he was finding out why the plates spoiled. Go now to the gigantic Eastman plant in Rochester and one finds experimental work there on a vast scale. In 1880 it was a different story.

In 1889 came the film for kodaks, eliminating the breakable glass plate. Thomas Edison heard about it and sent William Kennedy Dickson to Rochester for a sample. Within two weeks the motion picture was born in the Edison laboratories at West Orange,

The market for films used for motion pictures grew by leaps and bounds. Eastman, cool, practical, careful, experienced Yankee that he is, saw his big opportunity and he never let go. From that time on the story of Eastman in a business way has been well known.

Three years ago Mr. Eastman turned over to his employees his vast enterprises worth hundreds of millions. He has given away many millions to the Rochester University, and a great school of music to the city of Rochester and has endowed it liberally. He has also given a fine theatre to Rochester. Excellent productions may be seen there at prices within the reach of all. But the half has never been told.

Mr. Eastman is again big-game hunting in Africa. I asked him before he left about his life and some of his thoughts about success. It was the day before he sailed.

"We all look at life out of the depths of our own experiences," he said. "Our lives are vastly influenced by our surroundings, our environment, but I think, much more by our ancestors.

"The picking of good ancestors, especially parents, has something in its favor," continued the mild-mannered philanthropist, with a smile. "It seems to be one of the prime requisites for a successful life in this highly competitive age. Other things are important, of course, but one must have the real thing within before results begin to show without."

The telephone rang, Mr. Eastman asked if I would answer it for him, as he had no secretary with him. It had to do with passports. Mr. Eastman wanted the telephone caller to come and arrange the passports with him personally.

"This is an age of speed and machinery, an automatic age," he observed to me. "People have more idle time now than when I was a boy. That is why I am interested in music. People must have something to fill the time and fill it emotionally," declared this big-business bachelor.

"Personally, I know very little about music. But I like to hear good music. So does the public, music that cannot be abused."

In his own home, George Eastman, living alone in quiet elegance and luxury, has his meals served to the accompaniment of the sweet strains of a richly toned pipe-organ.

Again he was asked his ideas of success. He is reluctant to speak his ideas on lines of a personal nature.

"I really don't know what success is, unless it is just attempting to do well, one thing after another," he replied. "That has been my experience in life. I have tried with what ability I have plus the experience gained to master each problem that presented itself to me. I don't know whether that is success or not. But that's all I have ever done."

Simple, unaffected, no frills or fuss, orderly, thoughtful, diligent, far-seeing, successful, George Eastman comes of a stock which performs brilliantly, but which is accustomed to speak softly of its personal achievements.

Three years ago a luncheon was given in New York to celebrate the birthday of Thomas Edison. Mr. Eastman arrived early. So did Mr. Edison. Strange to say, they had never met. Someone introduced them.

"I've heard a lot about you," said Mr. Edison, as he extended his hand. Mr. Eastman was ready.

"I bought a dynamo from you in 1885," he answered with a broad grin.

"Was it good?" asked Mr. Edison, beaming.

"Pretty good machine," Mr. Eastman replied, "I've got it yet, and it will still work."

"That's fine," Mr. Edison said. "And say, your film is pretty good, too."

GEORGE EASTMAN

Born at Waterville, N. Y., July 12, 1854, the son of George W. and Marie Kilbourne Eastman. Educated in public schools of Rochester, New York. Became an amateur photographer and perfected a process for making dry plates, manufacturing them on a small scale in 1880. Invented the kodak. Chairman of the Board, Eastman Kodak Company. Leader in business and philanthropic movements. Has given away a fortune estimated as high as $50,00,000 to institutions of higher education, art and music. Is a bachelor.

Einstein Theory and the Fourth Dimension

By H. Gernsback

Member American Physical Society
Editor Science and Invention

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(Continued from November). Once we admit the Lorentz-Fitzgerald contraction theory, we must also accept another equally astonishing one, and that is what we call the theory of **local time.** Take two clocks running together in perfect accord. If one of them is placed upon a moving platform, or if both of them are placed upon such a moving platform, their times will not be the same any longer, but will vary, in order to vindicate the Michelson-Morley experiment. Thus while the clock which moves keeps perfect time, yet the seconds it ticks off are longer than those of the clock at rest. We have thus two different sorts of time! So far the Lorentz-Fitzgerald contraction theory has not been confirmed. It is doubtful whether either will ever be actually proven by experiment.

How Are the Airplanes Moving:

We now come to another aspect of relativity. Consider two airplanes passing one another, each moving at the rate of 200 miles per hour. This gives us a relative of 400 miles per hour considering both of them. We also find the astonishing result first laid down by Einstein, viz., that it is impossible for an observer on a moving body to ascertain the speed of the other moving body by any means or by any instruments known to science.

For the two airplanes, moving at a relative motion of 400 miles per hour, **are moving in many other directions** as far as the earth, or rather the universe, is concerned. For while the airplanes are moving at a certain speed, the earth's surface, which carries the planes, is moving at a different speed. Again the earth moves itself. We first have the axial rotation of the earth from west to east at a speed of 1,039 miles an hour. But, while the earth is spinning like a top, it also moves forward in its orbit around the sun at a speed of 65,533 miles an hour; but this is not all. We still have the cosmic drift whereby the earth as well as all the other planets and the sun itself are carried forward in space in a sort of huge spiral. In other words, **the earth is moving in three directions all at once:** first, axial rotation; second, orbital motion; third, cosmic drift.

But let us revert to the airplanes. It now seems hopeless to figure out not only at what speed they are really flying, **but in which direction they are going.** You see, everything is relative in this world. When you take a train from New York to San Francisco, you have every reason to believe that you are moving from east to west at the speed of the train, which let us say is sixty miles an hour. You are quite certain you are going west. You do nothing of the sort. **You are going due east,** because the earth revolves from west to east, and, while you move west at the rate of 60 miles an hour, **you are really going east** due to the rotation of the earth at a speed far exceeding many times 60 miles an hour. In other words, while you think you are going west at the rate of 60 miles an hour, you are really going east at nearly ten times as great a speed. This is another instance of relativity.

This brings us to the fourth dimension. As we have just seen, everything is moving. Nothing really stands still. Anything that we can imagine really moves, whether it is stationary on earth or anywhere in the universe. Heretofore we said that an object, let us say a cube, had length, width and depth. This is our classical three dimensional body, but in Einstein's world, we must now add another dimension, the fourth dimension, viz., TIME-SPEED. If we move a so-called stationary body, this body, which let us say is a brick, at a speed of about 100,000 miles per second, we find that it contracts somewhat. While moving at a speed of about 175,000 miles per second—in other words, almost as fast as light itself—we find that our brick has contracted sufficiently to almost form a cube. Thus our rectangular brick, while at rest, shortens or contracts in the direction of its axis when speeding at a tremendous speed. Inasmuch as this contraction or shortening only takes places while the brick speeds on, and because you cannot have speed without time, the fourth dimension of this brick is now termed time-speed. This is an astonishing result, but it probably comes nearer the truth of what the fourth dimension really is than any of the older theories in vogue heretofore. It is rather difficult for us to comprehend just what this fourth of the four dimensions, viz., length, width, depth, time-speed, really means because on earth, as far as we ourselves are concerned, there are no such speeds as 186,000 miles per second, or even 100,000 miles. We simply cannot comprehend such speeds.

Yet every time we have ourselves X-Rayed, the particles that are shot off from the anode of the X-Ray tube travel precisely at such tremendous speeds and, due to their speeds, produce such extraordinary results.

Light Is Four Dimensional:

Take a ray of light traveling 186,000 miles per second. Interpose a cube of glass that may be a yard thick between yourself and the ray of light. Although glass is one of the hardest and densest substances known, the light ray passes right through it as if the wall of glass were not there. Yet we have reasons to believe that light really has substance. In other words, the particles which make up light are just as solid and real as the brick mentioned before, but in moving at such a tremendous speed, these particles undergo certain physical changes, of which as yet we are ignorant because these particles truly move in the fourth dimension and, as such, are subject to entirely different laws from those which we know now.

The same is the case of radium. We know that radium shoots off highly charged alpha particles at a speed approaching that of light. These particles, which are just as real as those which make up a brick, are hurled right through glass, metals, a human hand, and most other substances as if these substances did not exist. These alpha particles, moving as they do, have a real fourth dimension; otherwise they could not and would not do what we know them to do.

The Pressure of light:

Once upon a time it was thought that light was simply a wave motion of the ether without having any substance. We are, however, slowly reverting to Newton, who steadfastly asserted that light is corpuscular, in other words, made up of small particles, and recent investigations tend to show that Newton was not altogether incorrect. We know, for instance, that the sun exerts a certain amount of pressure on the earth, amounting to over a hundred tons. This pressure is just as real as if fine streams of water shot from the sun were pressing upon the surface of the earth. This pressure of the light is proven most effectively by the comet's tail. The tail of a comet, as we know, is always turned away from the sun, no matter where the head is located in its orbit around the sun. As is well known, the tail of the comet, which is made up of thin gases, is moving in a vacuum. As the tail is sprayed with the rays of the sun, a certain amount of pressure is brought to bear upon the gas particles, and they thus move away until they encounter the least resistance, which is right behind the comet's head. The comet's tail in this case behaves exactly in the same man-

Concluded on Page 31

Akeley Has Wide Range of Adaptability

By Ira B. Hoke, *A. S. C.*

In the early days of specialized Akeley cinematography when the gyro camera was first brought from its intended field of operations, the African veldt, to the studios of Hollywood, leading directors and producers immediately recognized in it an instrument admirably adapted to photograph difficult scenes from hitherto inaccessible places. From those days, through years of efficient service, the Akeley camera has proven the justification of their expectations.

With the advent of the so-called "German Influence" several years ago the first camera to be called into service in the production of creative angles was the Akeley. Because of its light weight, facile leveling device and gyroscopic control, directors found chimerical ideas efficiently screened by this remarkable camera. The Akeley specialists were called upon to lash their instruments high on the masts of ships, on the arms of derricks, or to be still different, in deep holes looking up.

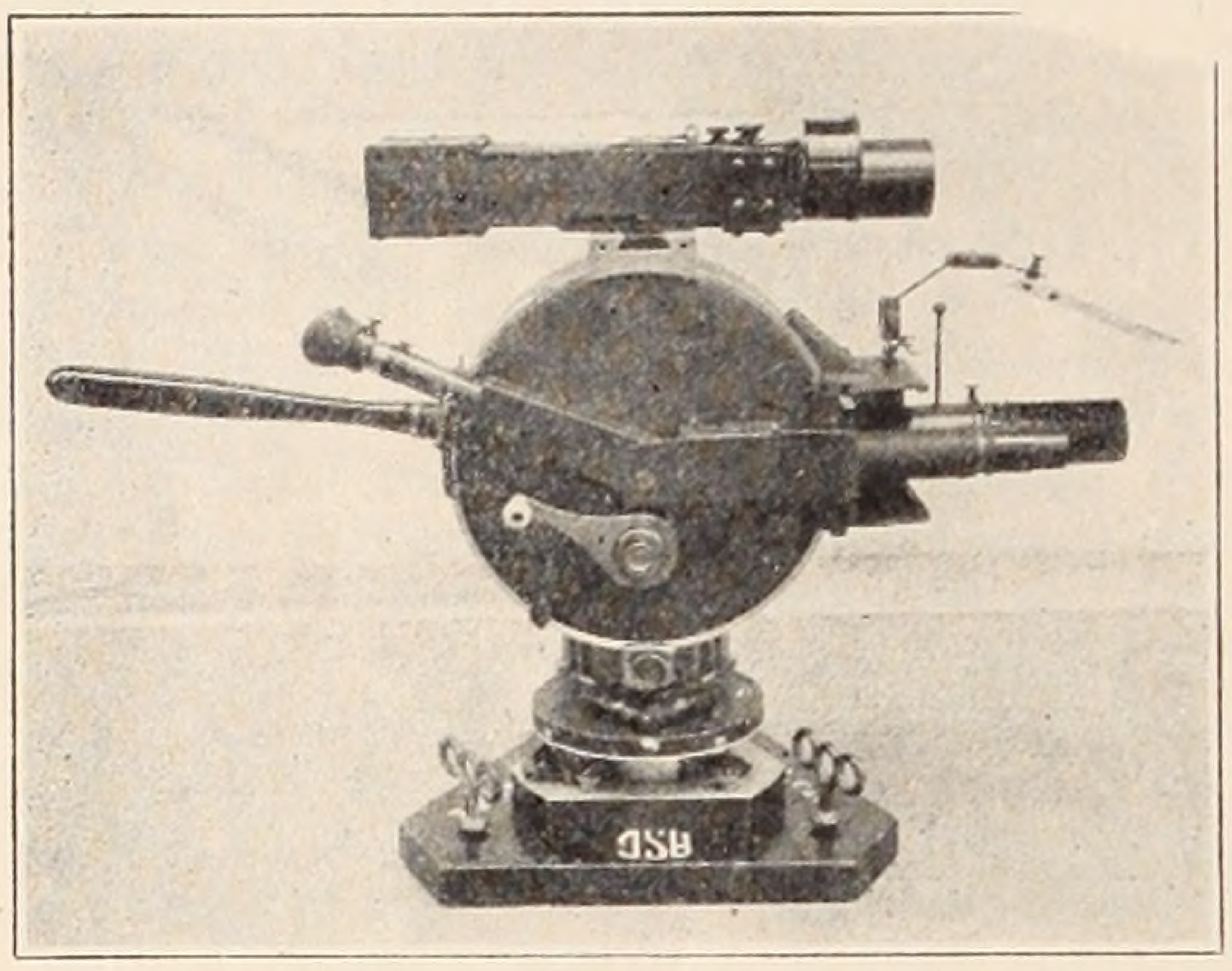

Figure 1. Illustrating lowest position possible to successful operation of the Akeley camera. The base of 6-ply laminated hardwood is capable of supporting the camera rigidly in any position.

Now they said of old that necessity is the mother of invention and certainly that adage applies to the Akeley specialists in their design of the two appliances illustrated with this article. No matter how carefully the cinematographer may make a temporary set-up in a difficult position the camera often proves unsteady, and, of course, the scene cannot be so photographed. Now in view of the unusual set-ups required of Akeley specialists all of them recognized the necessity of being able to dispense with the time honored tripod occasionally and still secure the camera in position so firmly that the controls worked freely while the machine retained its required steadiness.

The first tripod substitute consists of a triangular base having a three-point contact with both the camera and whatever object it is desired to attach the camera upon. This device blossomed out simultaneously among a number of specialists, so no credit can be given its inventor. The base is constructed of laminated pine, nine thicknesses in all, with crossed grains. This makes a strong, light base which is capable of supporting the Akeley camera safely in normal or in vertical positions as well as affording an extremely low position if the camera is to be placed on the ground or in a camera pit. The base is quickly secured to the camera by three knurlled-head machine screws, and to the supporting object by lag screws or long-shank stage screws.

This triangular base is also used successfully in photographing running inserts wherever iron railings are provided on the insert car. A plank is secured across the railings in such a manner that it makes a flat table-like surface. To this the camera is secured by lag screws. A set-up of this kind obviates the danger to the cinematographer from slipping tripod points, as it makes the camera an integral part of the car.

By far the most complete and adaptable device of this kind is the combination baby tripod designed and built in the machine shop of John S. Stumar, A. S. C.

At the request of Akeley specialists of the Universal Studios, Mr. Stumar designed this tripod to allow the Akeley camera to be placed at any height from the stage desirable. The tripod at its fullest extension comes just below the regular Akeley tripod height when closed. From this extension any height is obtainable down to an actual set-up on the floor or ground. This latter set-up is accomplished in a celver manner by attaching the tripod base, by means of a standard tripod thread, to the cone-shaped adapter used by the Bell & Howell and Mitchell cameras in low set-ups.

When the tripod is used standing on its legs, at any stage of extension, a stout hook takes the place of the cone base so that the tripod may be securely fastened to the stage with a chain and turnbuckle. The tripod being only 20 inches in height when closed allows the Akeley to be placed in numberless places where, with more bulky tripods, cameras could not be operated.

About the time the Akeley specialists found means of fitting the condensed camera into difficult positions two other problems presented themselves. First, they found the eyepiece, or focusing tube, was often in an inaccessible position for observation of the action to be photographed. This was a knotty problem, and it was not until the introduction of the Mitchell correct vision viewfinder that the solution was presented. This finder mounts either on top or on the left side of the camera, thereby giving two positions to suit conditions of various set-ups.

Secondly, the specialists often found ideal locations for their cameras that were unusable because, by no amount of gymnastics were they able to wrap themselves around the camera into a position for cranking. Mr. Ray Ramsey, veteran Akeley specialist, solved this problem by a clever adaptation of the Bell & Howell Cinemotor to the Akeley camera. The motor is quickly attached and affords even shutter speeds under the most trying circumstances.

With the aid of the devices outlined, the field of the Akeley has increased until it has become an outstanding instrument for the photography of difficult angles, running inserts and most important of all aeroplane photography. With its wide range of long, focal-length lenses and the steady motor-driven shutter, close-ups from one aeroplane to another while in flight become possible, and their immense value to a production is illustrated by the thrilling scenes so photographed in two of the current feature flight releases.

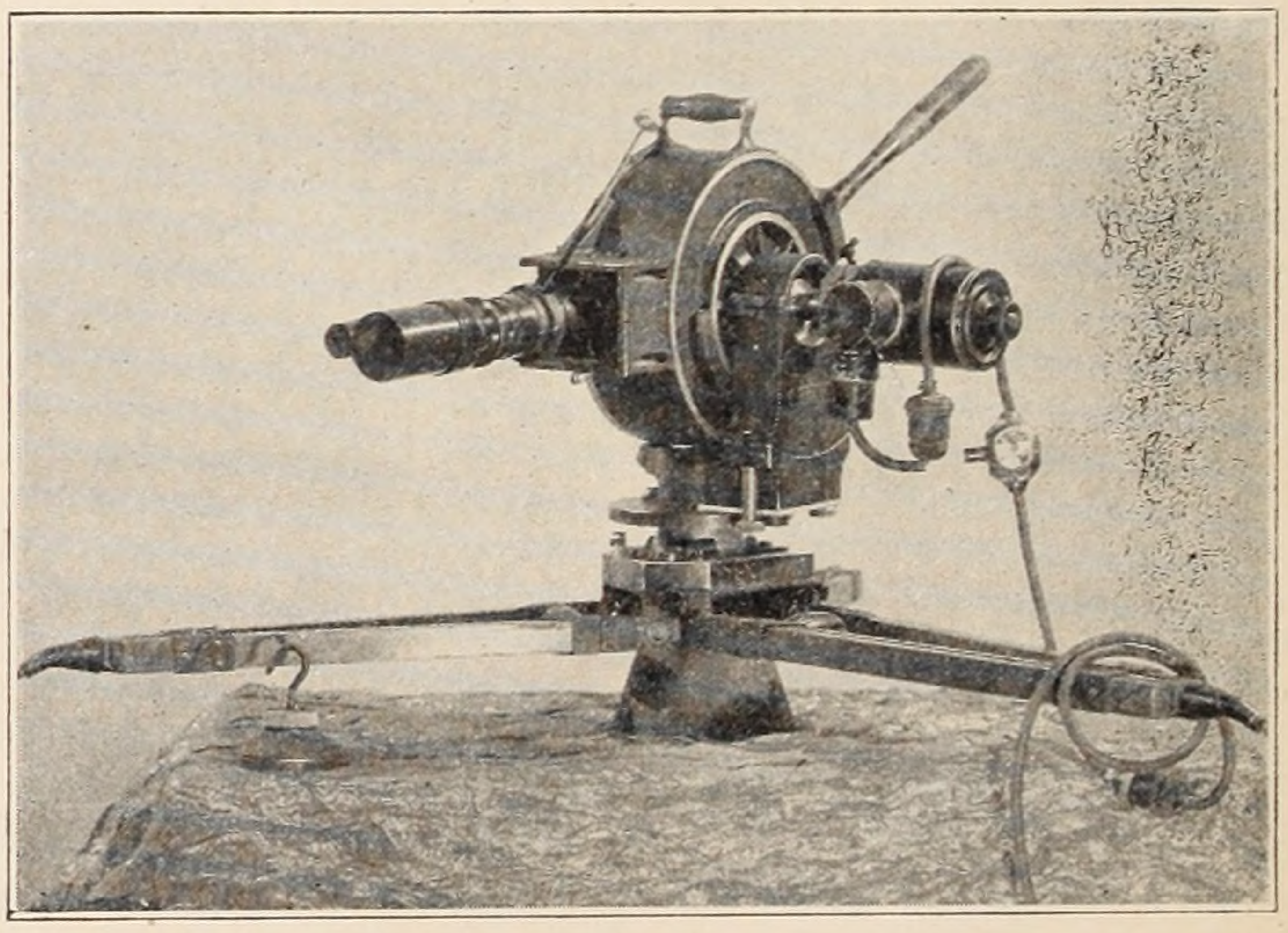

Figure 2. Showing baby tripod extended to allow use of hollow cone base in extremely low positions.

Thus it is that once again the Akeley specialists have given to the progressive directors and producers of today a photographic instrument with such a wide range of adaptability that every type of picture of the future will benefit materially by the inclusion of special scenes made with this remarkable camera.

No Strike of Cameramen

In a recent issue of a Hollywood film periodical a story was published which seemed to infer that a strike of cinematographers might be impending.

The AMERICAN CINEMATOGRAPHER is in a position to state on supreme authority that no such thing as a strike is considered by the cameramen and they have no thought except to cooperate with the producers in every possible way.

Mohr Shoots 'Broadway'

Hal Mohr, A.S.C., is preparing to shoot "Broadway," Universal's next big sound special. It will be all talkie and directed by Paul Fejos. Glen Tryon will be featured with the original stage cast.

A. H. Boradaille, A.S.C., has been assigned to the sound picture department at Lasky studios.

I. B. E. W.

The Studio Electricians Local 40 I.B.E.W. will hold their Benefit Frolic and Ball at the Biltmore Hotel Ball Room, Los Angeles, December 28th, 1928.

Both women's and men's fashion show, vaudeville entertainment, and the Stars of Filmdom will be there.

Entrants are being received for the Queen contest to decide who will be Goddess of Electricity. Local 40 is offering an Essex Coach as a prize to the Queen.

Many beautiful awards will be made to those present at the ball. Contest office has been opened at 6250 Hollywood Blvd., Hollywood.

"Hell's Angels"

Alvin Wyckoff, A.S.C., and Victor Milner, A.S.C., have been making special shots for Howard Hughes, director of "Hell's Angels" at Caddo. Among these was a series of the interior of a Zeppelin, showing the mechanism for bombing. Caddo has forty men on this picture at Oakland airport.

Acknowledgement

It being the custom to wish everybody a Merry Christmas and a Happy New Year THE AMERICAN CINEMATOGRAPHER hereby cheerfully does its duty and heartily conforms to custom, but it makes a gesture of especial cordiality toward those advertisers who have so heartily supported our little journal through the eight years of its existence and thereby enabled it to grow into the full stature of an internationally recognized technical magazine. For this encouragement THE AMERICAN CINEMATOGRAPHER is enduringly grateful.

Einstein Theory and the Fourth Dimension

Continued from Page 29

ner as a weather vane, which always places itself in the line of least resistance, pointing with the arrow to the direction whence the wind is blowing strongest. The pressure of light has been verified by many experiments on earth as well. In one of them a light ray coming from a distant star is deviated by the gravitational field of the sun. This experiment has actually been proven on a photographic plate. (See "Electrical Experimenter," January issue, page 887.) If the ray of light in this experiment was merely a wave motion of the ether, it is inconceivable how it could possibly be deflected by the sun's gravitational field.

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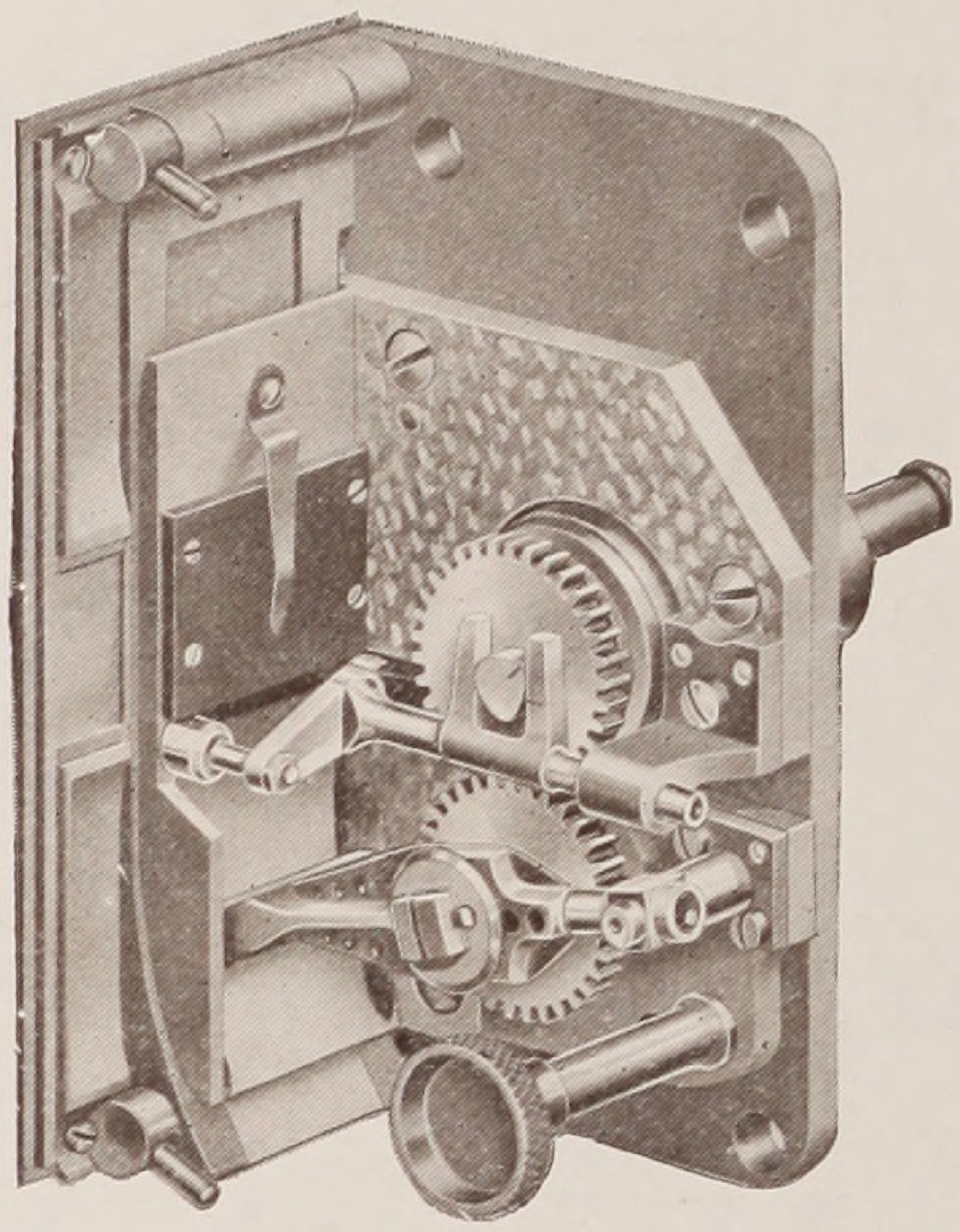

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